

Shortwave and Scanning Frequencies, How-To's, and Radio Reviews

Vol. 16, No. 10

October 1997

U.S. \$3.95

Can. \$6.25

Printed in the United States

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Cover Story



HR2369: Another Specter Looms for Radio Listeners

An editorial feature by Bob Grove

If HR2369 has its way, *verboten* will be tuning in to business band frequencies (good-bye NASCAR), public safety frequencies which share trunked frequencies with SMR (good-bye 83% of 800 MHz public safety communications), and anyone caught manufacturing, selling, or importing a receiver which picks up these frequencies would be subject to a whopping fine and imprisonment.

This Bill goes on to criminalize merely listening to—rather than misuse of—prohibited frequencies. And exactly which frequencies are affected is extremely unclear. If this Bill's intent was to further protect cellular and paging communications, it is like trying to hit a mosquito with a salvo of buckshot.

As creatively illustrated on our cover, Congress fantasizes that it can surgically carve out specific frequencies without killing the scanner industry. It's not that simple. Cellular and paging services need to encrypt, and Congress needs to take down the fence and listen to the voices of its constituents. See page 8 for background.

**Late news item:
BNN Accused of
Illegal Interceptions**

See page 62

Reviews:



Is the Lowe SRX100 an HF-150 for half the price? Afraid not, says Magne, but it still has some excellent features going for it. See page 92 for the bottom line. Parnass pronounces the Radio Shack PRO-67 portable a fast scanner with the good image rejection expected of triple conversion circuitry (page 94).

Radio That's Out of This World..... 14

By Philip Gebhardt

Radioastronomy may sound like a hobby that's out of the league of the average hobbyist, but you may already have heard meteor signals on your shortwave, FM, or TV receiver without knowing it. With several major showers due this fall, stay warm and dry while watching meteors—by radio.



Emergency Medical Services..... 20

By Ed Muro

The Emergency Medical System has transformed our health care system since it was inaugurated in 1966. Its effectiveness is due in part to the close coordination with other medical and rescue services. EMS radio traffic is prime listening for off-duty personnel, first-responders, volunteers, and many private citizens.

Shortwave & Satellites & Cyberspace..... 23

By George Wood



When George Wood's *Sweden Calling DXers* evolved into *Media Scan*, it was a sign of the times—not necessarily one of his choosing. In the intervening years the changes have taken broadcasting onto the Internet as well. Wood's insightful article looks at the evolution of international broadcasting from all perspectives and finds everyone has something to gain.



MONITORING TIMES
(ISSN: 0889-5341) is
published monthly by
Grove Enterprises, Inc.,
Brasstown, North
Carolina, USA.

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Subscriptions: order@grove.net

Subscription Rates: \$23.95 in US; \$36.50
Canada; and \$55.45 foreign elsewhere, US
funds. Label indicates last issue of subscrip-
tion. See page 103 for subscription information.

Postmaster:
Send address changes to *Monitoring Times*,
P.O. Box 98, Brasstown, NC 28902-0098.

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GroveNet hosts the following managed lists free of charge to the hobby.

acars ACARS mailing list
amfmtdx AM/FM/TV DX mailing list
code30users Hoka Code 30 demodulator users
code3list Hoka Code 3 and Code 3 Gold decoder users
fedcom Federal communications
hearsat-I HearSat-I Mailing List
milcom Military HF/VHF/UHF communications monitoring
scan-dc Scanner radio topics in Washington, DC - Baltimore
trunkcom For discussion about the new TrunkTracker scanners
wun Worldwide UTE News Club List (Nonbroadcast SW Radio)

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A Fond Farewell to Larry Miller

Larry Miller has decided it's time to turn his attention to other endeavors and has submitted his resignation to *Monitoring Times* with this issue (see p. 6). Although Bob Grove, as founder of *Monitoring Times*, initiated the magazine's basic approach and style, it truly came into its own when Larry Miller joined the team in July 1986. He courted and won a top-notch staff of writers—most of whom are still with the magazine today. Additional hours were spent hammering out *MT*'s characteristic philosophy and approach in countless phone calls with the writing staff.

The groundwork laid by Larry Miller made it a relative breeze for me to step into the editor's position, but the fact that he stayed on to edit two columns was the greatest gift he could have given—both to the magazine and to myself. Although Larry's talents were somewhat stifled in the *What's New* section, his creativity was obvious in his sometimes off-beat treatment of radio news in *Communications*. I have appreciated his help, his humor, his

perspective on life and on radio, and his friendship. We will all miss you greatly, Larry.

Bob Grove, as publisher and first *MT* editor, has high praise for Larry.

"It's always hard saying 'Goodbye' to an old friend, and Larry Miller has been a professional colleague for more years than either of us would care to admit. But I understand his decision. Larry has an active, inquisitive mind; he is always looking for new avenues, new opportunities, new challenges. I commend his enthusiasm for writing, admire his ability in front of a computer (remember when it was a typewriter, Larry?), and wish him all the best in his new direction. Most of all, I thank him for sharing his wisdom, dedication, and friendship for all these years."

Monitoring Times and the radio hobby owe you a big debt of thanks, Larry. May you never lose your love for radio—it's in your blood, you know it is—

Ocean Hopper

Several of you were inspired to write regarding the August "Ocean Hopper" article. Let's start with a note from the author, Al Cikas, KA9GDL, who found a few omissions in our redrawn schematic. He says, "First, the unmarked grid resistor on the 6AT6 detector is 1 megohm. Second, the grid and cathode pins of the 6AQ5 are unmarked as well. The grid is tied to pins 1 and 7, the cathode is tied to pin 2."

Letters from Jack Roubie K2JDD, E. Syracuse, NY; Bruce Camlin N3TSQ, Baden, PA; and Ross Smith, Fallston, MD, all agreed that, although each writer owned a different model of the radio, all models were unsafe.

Here are excerpts from Ross Smith's letter: "I purchased an Ocean Hopper kit in the late 1950s...As you stated, the Ocean Hopper does not have enough volume to drive a speaker on all but the strongest stations. I replaced the band set dial with a vernier dial

and added a 12AT7 dual triode stage between the 12AT6 and the 50C5. The 35W4 was removed, the 50C5 circuit was moved over to the 35W4's former location, and the 12AT7 was wired in the 50C5's former location. A 300 ohm resistor was substituted for the 200 ohm resistor in the filament circuit, a selenium rectifier replaced the 35W4, and a potentiometer was added between the two triodes as a volume control. With the added amplification the set now had room filling volume on almost any station.

"The Ocean Hopper has survived several moves and was packed away in the basement when the latest issue of *Monitoring Times* came in the mail. After reading your article, I took my modified Ocean Hopper out of 'mothballs,' attached an antenna and speaker and turned it on. It still works.

"I have to agree with you that it is an unsafe piece of equipment. I try to keep one hand behind my back when measuring voltages, etc. with the cover off. Your redesign of the circuit using a power transformer and a 6AQ5 is a tremendous improvement. A 12AT7 or one of its relatives (stronger 12AX7 or weaker 12AU7) can be added to your circuit using its 6.3 volt filaments in parallel or in series for 12.6 volts.

"Thanks for bringing back fond memories."

Breaking the Cellphone Habit

Dave Stark, NF2G, editor of *Scanner Master Upstate New York Guide*, has this suggestion to make. "From now on, in all

(Continued on page 102)

The Athens (Georgia) Radio Club needs your help.

We use an old converted garage owned by the county for meetings and a place to house our two meter repeater. We also used an old tower at the county site for our repeater antenna. Not too long ago, the tower was deemed unsafe and the county took it down, leaving us no tower for our repeater.

For years, we have helped shuttle emergency workers during ice storms, acted as severe weather spotters, provided communications and emergency support for public events—the same things many clubs all over the country do to help their fellow citizens.

We asked to go on the county's current public service communications tower or even a water tank. The county's new emergency director said "No."

We approached a commissioner who's on our side. He queried the director. In a nutshell, the emergency director said our free, volunteer services are no longer needed or wanted!

The consolidated city and county government of Athens/Clarke County, Georgia, has plans for an 800 MHz trunked public safety radio system at a cost of over \$4 million. The county will install three towers to support the system. The director, in his rebuttal, said the planned redundancy of the new system would eliminate the need for other communications.

Anyone who knows the least bit about trunked systems knows they aren't fail safe. Could any of your readers who have run up against this type of attitude in their government offer any suggestions?

Thanks for your help.

Larry Cole, N4IWP
President Athens Radio Club
2023 Hog Mountain Road
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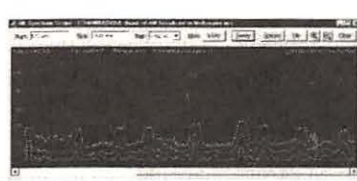
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Thanks for the Memories

Before we get started this issue, I wanted to let you know that I have handed in my resignation from *Monitoring Times*. To say that this was a difficult decision is a major understatement. I have written for this magazine and its predecessor, *International Radio*, for fifteen years.

The truth is that I could write a hundred pages about my experiences at *MT*. I'd want to tell you about Bob and Judy Grove, their compassion and integrity. These are some of the finest folk I have had the privilege to meet and knowing them helped melt my cynicism about people. Please continue to support the Groves in whatever they do.

Editor Rachel Baughn has become of friend of ten years. We have been through much together. We even flip-flopped jobs. At one point she worked for me; several years later, I was writing for her! The time together was all too short; I will miss having a reason to talk with her.

And you! We may have met at one of the conventions. It's possible that we exchanged a few letters or maybe you were kind enough to call or send in a newspaper clipping. Maybe we never crossed paths in any other way than in the fact that you subscribed to this magazine. No matter: please accept my thanks. It is rare indeed for a person to be able to work in the hobby that they love, to wake up every morning and know that they are going to have fun. You, by your participation, gave that gift to me. Please allow me to say thank you. It's been a wonderful life. Thanks for being a part of it.

—Larry Miller

Burning Bridges

The BBC is known for its formalism, even starchiness. So when veteran BBC-TV broadcaster Alan Towers did a little editorializing, it took viewers — and no doubt management — by surprise. At the conclusion of the 5:25pm newscast, Towers announced his resignation. "After 25 years I'm leaving the BBC. When I joined, it was led by giants. Now it's led by pygmies in grey suits wearing blindfolds. How that?" You could hear a pin drop.

The eight-second outburst took the show's producer by surprise as the broadcast was not scheduled to be Mr. Tower's last. All of that probably changed rather quickly, though.

One Adam 12, 10-99 in Progress

Pandemonium ruled on West South Street in Frederick, Maryland, when two baby ducklings tumbled into a storm drain. The mother duck paced nervously nearby as Michael Vlahos, who witnessed the event, called police.

Before long the news was dispatched out over the airwaves: baby ducks down sewer

drain! Officer Joe Bourke arrived, but even Frederick's finest was helpless to assist until Oscar Shankle arrived with his tow truck. Shankle, who heard the report on his scanner, backed the truck up to the storm grate and pulled it off with the tow hook. Before long, the baby ducks were reunited with mama duck.

Smiles were all around as a photographer for *The Frederick News* took congratulatory pictures. Another triumph for scanning. Front page news in Maryland, it was.

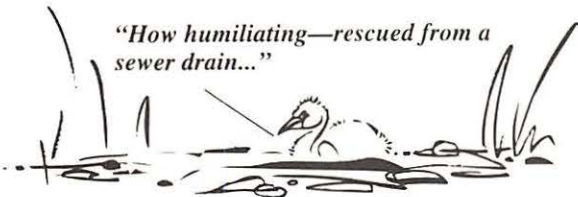
Scanner Listener is Hero

Workers in the downtown Birmingham, Alabama, BellSouth building may have a scanner listener to thank for their lives. Sheron Halmark said that the building's fire alarms didn't go off and the only way she knew there was a fire was from the scanner she keeps at work.

Halmark alerted her boss, who called security and then told workers to leave the building. Meanwhile, heat was coming out of the air vents; the lights soon went out, too.

"Instead of listening to the radio," Halmark told reporters, "I listen to my police scanner because you never know what's going to happen." Like baby ducks in a storm drain. The fire was confined to one room. No injuries were reported.

"How humiliating—rescued from a sewer drain..."



"Actually, Debbie, since you're going to be in school all day, how about dropping me at Ken's house?"

Computer Control

If you thought computer controlled scanning was hot, wait until you see what they've done to Barbie. Equipped with a computer chip, Mattel's "Talk With Me Barbie" will be able to chat about dozens of subjects and call children by name. Using a CD-ROM that comes with the doll, kids can program Barbie's

thoughts.

Not only does the talking Barbie expound upon subjects of interest to those who program her but her lips move in sync with the words. The doll is due in stores November 1 and is expected to sell for \$89.

Radio Garbage

An Ohio man is in hot water after investigators saw him dump a radio in the garbage can behind a fast food restaurant. Gary Goodmanson, former president of the International Brotherhood of Electrical Workers local in Mentor was the suspect in a three-month long string of phoney distress calls that plagued the Coast Guard's Fairport Harbor station east of Cleveland. One of the calls brought rescuers out in 30 mile-an-hour winds to fight 15-foot tall waves during a search for a sinking ship with 21 people aboard. Air and water rescue crews from three states were involved.

The Federal Communications Commission tracked some of the bogus calls to Goodmanson's condominium. Investigators subsequently took a scanner, radio transmitter, and other marine equipment from the home. Goodmanson was arrested about 4 hours after the Coast Guard received a call on the marine band from a man reporting that his boat was out of gas and drifting on Lake Erie. A two-hour search of 36 square miles of water turned up nothing. Mentor police then saw Goodmanson leave his house, go to a restaurant, and dump the radio in a garbage can.

Goodmanson pled guilty to three misdemeanor charges in municipal Court then was taken to U.S. District Court in Cleveland where he was charged with interfering with government communications. If convicted



"Wow, when MT said that some people wanted to trash scanning, they really meant it!"

on the federal charge, Goodman could be subject to six years in prison and a \$250,000 fine. He could also be required to pay for the needless search of Lake Erie.

Conversation with the FCC

Pirate radio was the topic of reporter Michael Canning's article. Included were these interesting quotes from Ralph Barlow, Tampa director of the Federal Communications Commission.

FCC agents don't have the authority to burst into a house and make arrests or confiscate equipment. "Our normal procedure is...administrative... We basically tell them to stop, and if they don't stop we [forward the case to the U.S. attorney's office.]"

The U.S. attorney's office could issue arrest and seizure warrants, which would be carried out by U.S. marshals with FCC agents accompanying as advisors. Regarding the possibility of this happening, Barlow relates that "[It is] a prohibitive amount of red tape for the FCC. You have to consider that the U.S. attorney has other things to deal with — drugs and everything else under the sun — besides this. So they handle these cases in accordance with their priorities, just like we do."

"We [the FCC] have priorities in investigations. Safety of life naturally comes first. That means ensuring the non-interference of fire, police, Coast Guard, and other emergency service radio frequencies."

In the Tampa area, Barlow says there are three cases against pirates with the U.S. attorney: 87X, 102.1, and 96.7 FM. But nobody is holding their breathe, at least not until a U.S. District Court in California rules on the controversial Radio Free Berkeley case. Twice in 1995, the judge refused to issue an injunction against that pirate.

Barlow admits some puzzlement about pirate radio. "As for these people who are thumbing their nose at federal authority, I can't really answer for them. There's such a

variety out over the air... I can't believe that nobody can find what they want to listen to...on the licensed stations."

Quick Cash

Want to make \$5,000? KZZU in Spokane, Washington, says it'll pay that much to anyone who helps them catch the radio jammer that's plaguing their airwaves. Since May, someone has been adding "editorial comments" like "KZZU sucks" to the station's rock music lineup.

WANTED

RADIO PIRATE

Attacks Radio Station

\$5,000 Reward Offered



After receiving several calls from listeners with the same complaint, KZZU realized there was a Radio Pirate breaking into KZZU's frequency. KZZU announces a reward of \$5,000 for information leading to the arrest and conviction of the Radio Pirate.

Calls on the Radio Pirate can be directed to (509) 324-3333. We encourage that callers leave name, phone #, address and specific information. In addition, KZZU needs on audio tape of the Radio Pirate.

\$5,000 REWARD

According to program director Ken Hopkins, the messages are probably taped since they repeat over and over. "I just got a call from listener who said he was driving with his kids when suddenly, over the air, he heard a string of obscenities and then an announcement that Santa Claus had just been shot."

KZZU originally tried to take on the jammer by making fun of him on the air and asking listeners to try and catch him on tape. The jammer has been "dark" for a while, a reaction to announcements on local TV that the station would aggressively pursue him.

There was one last broadcast, though. The jammer announced that if listeners wanted to hear more of what he had to say, they should tune in to Channel 7 or 13 on their CB radios.

Communications is written by Larry Miller with editorial assistance from Rachel Baughn, Larry Van Horn, and the MT art department. We also receive help from the loyal members of our "communications" monitoring team who clip out and send in interesting items about communications, the absurd, and the world at large: Dave Alpert, New York, NY; Anonymous, Albany, NY; Harry Baughn, Brasstown, NC; David Beck, Birmingham, AL; Bill Craig, Burbank, CA; Maryanne Kehoe, Atlanta, GA; Elbert May, Grayville, AL; Officer John Malloy, Brook Park, OH; Ken "Quack, Quack" Martin, Thurmont, MD; Daryl Symington, Holland, OH; Dr. Sue Pennington III, Philadelphia, PA; and Wilbur Yancy, Claims Depo, AZ. We also consulted the following publications and list their names in appreciation: Dispatch Monthly, Radio World, Satellite Times and the WSYI Report.

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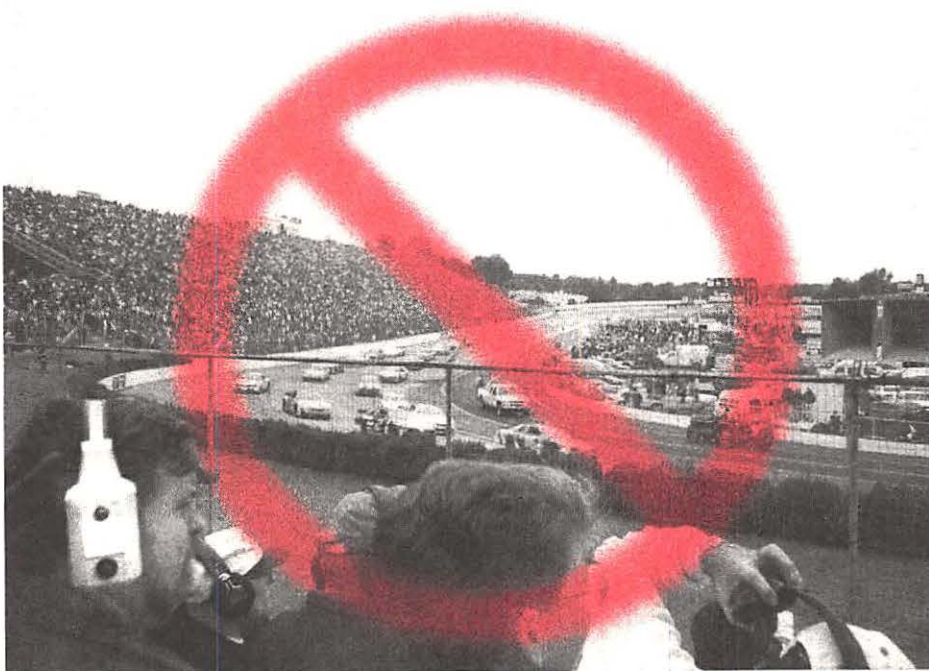
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Are the scanner listeners in the crowd at this NASCAR event doing something illegal? They will be if HR2369 becomes law. This ban on the business band would make listening to NASCAR drivers and even the manufacture of such radios illegal!

Another Specter Looms for Radio Hobbyists

An Editorial Feature by Bob Grove, Publisher, *Monitoring Times*

HR2369 is the broadest-sweeping anti-scanner Bill ever written in the name of privacy protection; if literally enforced it would virtually eliminate the scanner industry, and impact on the shortwave and satellite communities as well.

Even a generous interpretation forbids reception of frequencies used by NASCAR teams, removes police and fire communications in some communities, and affects agencies such as the Civil Air Patrol—communications which the public uses on the job, in community volunteer work, for entertainment, and for education.

The penalty for any person who manufactures, modifies, imports, exports, or sells any device capable of receiving the prohibited frequencies also seems excessive—up to a \$500,000 fine and five years in prison! Also, no provision is made in this new Bill for grandfathering in older receivers. Is this the end of hobbyists swapping out older scanners and general coverage receivers at a hamfest in order to upgrade to newer equipment?

■ A Little History

In 1986, the Cellular Telecommunications Industry Association (CTIA) successfully lobbied for legislation to prohibit the deliberate monitoring of mobile telephones. The resulting Electronic Communications Privacy Act (ECPA) did little to discourage curious scanner listeners from tuning in on cellular and other mobile telephones. At that time, the CTIA promised it would soon offer digital encryption to provide privacy to its customers.

In 1993, again prompted by the CTIA, Congress directed the Federal Communications Commission (FCC) to deny certification to any scanner which received, or could be readily altered to receive, cellular telephone frequencies.

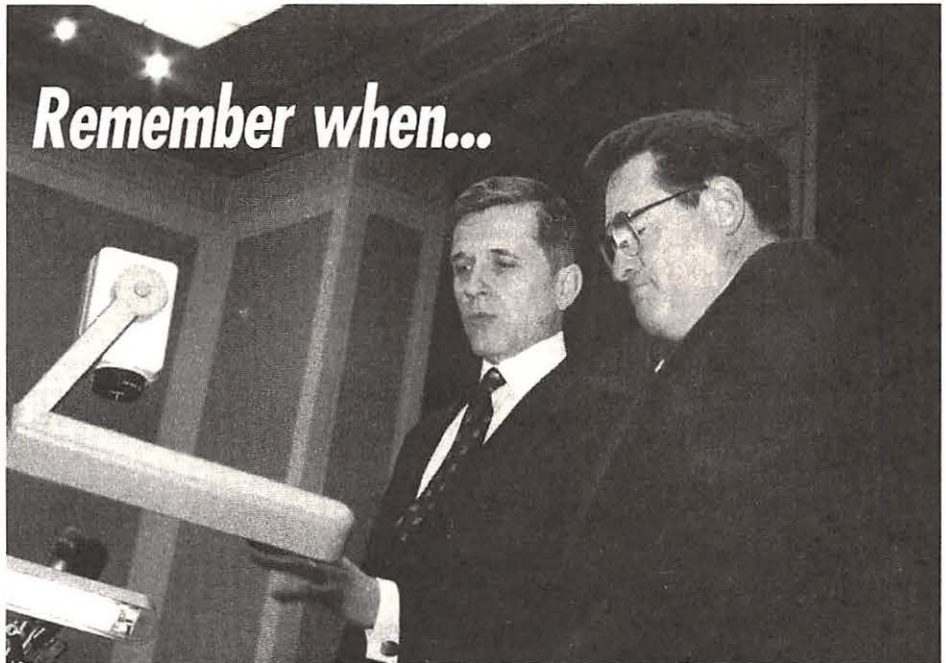
However, because of the number of cellular-capable scanners on the market, and the ready alteration of many new models which were already certified, scanner listeners still had an open line to phone calls. The long-promised encrypted communications were still not

available except as an expensive add-on, paid for by the consumer.

On February 5th, 1997, hearings at the House Subcommittee on Telecommunications, Trade, and Consumer Protection convened, focussing on the continued vulnerability of cellular telephones to scanner eavesdropping. The hearings were prompted by the embarrassing disclosure that one of their own, Newt Gingrich, had been overheard on a cell phone conversation which implicated him in a strategy to evade a provision of the Ethics Committee. The conversation was overheard and recorded by a Florida couple using an unaltered Radio Shack PRO-51 scanner.

Rather than recognize the failure of the cellular industry to utilize readily-available voice encryption technology—eleven years after it was promised—the blame for the ease of interception was once again placed on scanner owners who were categorically characterized as “high-tech eavesdroppers.” Representative Edward Markey (D-MA), the author of the 1993 amendments and the most animated and vocal of the Subcommittee members, promised we would “see scanner sales drop precipitously.” He appears to be keeping his word by introducing HR1964 (see September 1997 MT).

It is clearly less expensive (though less effective) to try to get Congress to repeal the laws of physics than to implement encryption. This became apparent during the February hearing in which CTIA spokesman Tom Wheeler was invited to dominate the proceed-



CTIA spokesman Tom Wheeler (left) and Subcommittee Chairman Bill Tauzin discuss the modification of a scanner during the February Congressional hearings. Oddly enough, the radio chosen for “restoration” was a Radio Shack PRO-26 — a scanner no one else has succeeded in restoring.

ings while other witnesses were denied the courtesy of reply or rebuttal.

During that hearing, a carefully-rehearsed demonstration between Wheeler and Subcommittee Chairman Billy Tauzin (R-LA) purported to show how easy it was to restore cellular coverage on a scanner—in this case, according to a Radio Shack official, a PRO-26. Curiously, this model has not been reported restored by anyone else and, although

withdrawn from the market because of the hearing, remains FCC certified!

■ Legislation Looms over the Industry

On June 19th, Markey submitted to Congress HR1964, a Bill intended to provide sweeping changes to both Internet practices and scanner enforcement. Much of the wording, including the substitution of “Commer-

The Target: Commercial Mobile Radio Service

Rep. Tauzin says it's not true that his Bill will deny racing fans their radios, but the case seems pretty clear. Let's take Jeff Gordon's team, for example. They've been heard on 467.0625 and 469.4875 MHz. Do you see those frequencies listed below under the prohibited Commercial Radio Service? Of course you do! The new law will prohibit the manufacture, sale, or even listening to any radio that covers these frequencies!

1) Private Paging Services

Private carrier paging system (PCPS): 929-930 / 931-932 MHz

2) Business Radio Services

VHF low band: 30.76-31.24 (9 discrete freqs) / 33.14-33.16 / 33.40 / 35.02-35.14 / 35.18 / 35.7-35.72 / 35.88-35.98 / 42.96-43.00 MHz

VHF Hi-band: 151.625-151.955 / 154.570-154.600 MHz

UHF band: 457.525-457.600 / 460.650-462.1875 / 465.650-467.1875 / 467.750-467.925 / 467.750-467.925 / 463.200-465.000 / 468.200-470.000 MHz

There are also a number of chunks of the 470-512 MHz that will be removed.

3) Specialized Mobile Radio (SMR) Services

851-866 (806-821 MHz) / 935-940 (896-901 MHz)

(home to many public safety agencies for whom there wasn't room in the 866-869 MHz portion)

4) Land Mobile Services in the 220-222 MHz region (recent regulations have turned this over to the CMRS)

5) Public Mobile Services

A) Paging and Radiotelephone Services

35.2-35.66 / 43.2-43.66 MHz / 152.030-152.240 / 152.480-152.840 MHz

154.625 / 157.740-158.100 / 158.460-159.700 MHz

B) Cellular Radiotelephone Service

869-894 MHz (824-849 MHz mobiles)

C) 454 MHz Air-Ground Radiotelephone Service

454-455 MHz (459-460 MHz mobiles)

D) 800 MHz Air-Ground Radiotelephone Service

894-896 MHz (849-851 MHz mobiles)

6) Offshore Radiotelephone Services

7) Satellite Mobile Services

137-138 MHz NVNG (148-150.050 uplinks) / 399.9-400.050 / 1525-1559 / 1610-1660.5 MHz

8) Personal Communication Services (PCS)

901-902 / 930-931 / 940-941 / 1850-1990 MHz

cial Mobile Radio Service" for "domestic cellular radio telecommunications service," in Markey's Bill appears to have come from a study by the Center for Democracy and Technology, released in June 1997, entitled "Communications Privacy in the Digital Age."

Nearly every endorsing organization for this study is a lobby for the paging, cellular, or wireline telephone companies. Jerry Berman, head of the Center (which was formed in Dec 1994), was instrumental in drafting the ECPA of 1986. It is ironic that this organization, so principled in its fight for free access to information on the Internet, should have—in the name of privacy—so dramatically curtailed public access to the airwaves.

Fortunately for the scanner industry, HR1964 has not at this writing found any cosponsors, nor is it scheduled for a hearing.

However, on July 31, Tauzin introduced HR2369, a nightmarish proposal which not only includes *all* of Markey's scanner-related prohibitions, but even changes the provisions of the original 1934 Communications Act (see accompanying Bill text). The simple expedient of replacing the word "and" with the word "or" now criminalizes the mere act of overhearing a communication protected by the Bill, even though it's transmitted without encryption, rather than penalizing the illegal use of such communication.

If literally enforced, HR2369 will virtually eliminate the scanner industry, an estimated \$200 million annual market; additionally, its ambiguous language impacts on the short-wave community as well since utility (nonbroadcast) communications occupy 78% of the frequencies below 30 MHz.

■ Accidental or Insidious?

Perhaps HR2369's authors simply don't understand their own Bill. We live in a technical era and few, if any, members of the Subcommittee are trained in telecommunications. Errors of commission, omission, and contradiction are rife in the Bill. Admittedly, Part A would seem to allow monitoring of public safety communications, but Parts B and C do not. If removal of public safety communications from Americans' radios is not an intent, as we are reassured by Tauzin's office, then why remove frequencies allocated to these services?

According to a Tauzin spokesperson, the Bill's intent is to ban any scanner capable of receiving mobile phone frequencies used by the Commercial Mobile Radio Service (CMRS). But, as seen in the accompanying sidebar, CMRS includes a great deal more than cellular phones and paging services. Of

HR 2369 IH 105th CONGRESS 1st Session

[Original text has been inserted where needed for meaning, with strikeouts and new text in bold.]

To amend the Communications Act of 1934 to strengthen and clarify prohibitions on electronic eavesdropping, and for other purposes.

IN THE HOUSE OF REPRESENTATIVES

July 31, 1997

Mr. TAUZIN (for himself, Mr. MARKEY, Mr. OXLEY, Mr. GILLMOR, Ms. ESHOO, and Ms. MCCARTHY of Missouri) introduced the following bill; which was referred to the Committee on Commerce

A BILL

To amend the Communications Act of 1934 to strengthen and clarify prohibitions on electronic eavesdropping, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the 'Wireless Privacy Enhancement Act of 1997'.

SEC. 2. COMMERCE IN ELECTRONIC EAVESDROPPING DEVICES.

(a) PROHIBITION ON MODIFICATION- Section 302(b) of the Communications Act of 1934 (47 U.S.C. 302(b)) is amended by inserting before the period at the end thereof the following: ', or to modify any such device, equipment, or system in any manner that causes such device, equipment, or system to fail to comply with such regulations'.

TO READ: No person shall manufacture, import, sell, offer for sale, or ship devices or home electronic equipment and systems, or use devices, which fail to comply with regulations promulgated pursuant to this section, **or to modify any such device, equipment, or system in any manner that causes such device, equipment, or system to fail to comply with such regulations.**

(b) PROHIBITION ON COMMERCE IN SCANNING RECEIVERS- Section 302(d) of such Act (47 U.S.C. 302(d)) is amended to read as follows:

(d) The Commission shall prescribe regulations denying equipment authorization (under part 15 of title 47, Code of Federal Regulations, or any other part of that title) for any scanning receiver that is capable of--

(1) receiving transmissions in the frequencies allocated to ~~the domestic cellular radio telecommunications service~~ **any commercial mobile service (as defined in section 332(d),**

(2) readily being altered ~~by the user~~ to receive transmissions in such frequencies, ~~or~~

(3) being equipped with decoders that convert ~~digital cellular transmissions~~ **digital commercial mobile service transmissions** to analog voice audio, or

(Continued on next page)

(4) being equipped with devices that otherwise decode encrypted radio transmissions for the purposes of unauthorized interception.'

(c) IMPLEMENTING REGULATIONS- Within 90 days after the date of enactment of this Act, the Federal Communications Commission shall prescribe amendments to its regulations for the purposes of implementing the amendments made by this section. In prescribing such amendments, and in response to subsequent changes in technology or behavior, the Commission shall review and revise its definition of the term 'capable of readily being altered' as necessary to prevent commerce in devices that may be used unlawfully to intercept or divulge radio communication.

SEC. 3. UNAUTHORIZED INTERCEPTION OR PUBLICATION OF COMMUNICATIONS.

(a) AMENDMENTS- Section 705 of the Communications Act of 1934

(47 U.S.C. 605) is amended--

(1) in the heading of such section, by inserting 'interception or' after 'unauthorized';
TO READ: Unauthorized **Interception or** Publication or Use of Communications

(2) in the second sentence of subsection (a), by striking 'and divulge' and inserting 'or divulge';
TO READ: No person not being authorized by the sender shall intercept any radio communication ~~[and divulge]~~ **or divulge** or publish the existence, contents, substance, purport, effect, or meaning of such intercepted communication to any person.

(3) in subsection (e)(1)--

(A) by striking 'fined not more than \$2,000 or'; and (B) by inserting 'or fined under title 18, United States Code,' after '6 months,'; and
TO READ: Any person who willfully violates subsection (a) of this section shall be ~~[fined not more than \$2,000 or]~~ imprisoned for not more than 6 months **or fined under title 18, United States Code**, or both.

(4) in subsection (e)(3), by striking 'any violation' and inserting 'any receipt, interception, divulgence, publication, or utilization of any communication in violation'; and
TO READ: (3)(A) Any person aggrieved by ~~[any violation]~~ **any receipt, interception, divulgence, publication, or utilization of any communication in violation of subsection (a)** of this section or paragraph (4) of this subsection may bring a civil action in a United States district court or in any other court of competent jurisdiction.

(5) in subsection (e)(4), by striking 'any other activity prohibited by subsection (a)' and inserting 'any receipt, interception, divulgence, publication, or utilization of any communication in violation of subsection (a)'.
TO READ: (4) Any person who manufactures, assembles, modifies, imports, exports, sells, or distributes any electronic, mechanical, or other device or equipment, knowing or having reason to know that the device or equipment is primarily of assistance in the unauthorized decryption of satellite cable programming, or is intended for ~~[any other activity prohibited by subsection (a)]~~ **any receipt, divulgence, publication, or utilization of any communication in violation of subsection (a)** of this section, shall be fined not more than \$500,000 for each violation, or imprisoned for not more than 5 years for each violation, or both. For purposes of all penalties and remedies established for violations of this paragraph, the prohibited activity established herein as it applies to each such device shall be deemed a separate violation.

(b) RESPONSIBILITY FOR ENFORCEMENT- Notwithstanding any other investigative or enforcement activities of any other Federal agency, the Federal Communications Commission shall investigate alleged violations of section 705 of the Communications Act of 1934 (47 U.S.C. 605) and may proceed to initiate action under section 503 of such Act (47 U.S.C. 503) to impose forfeiture penalties with respect to such violation upon conclusion of the Commission's investigation.

most concern are public safety systems, which are currently legal to monitor, and which share frequency spectrum with Specialized Mobile Radio Services (SMR).

SMR and Business Band systems are classified in the Commercial Mobile Radio Service because they both interface with wire communications which are protected. With passage of this bill the reception of police, fire, ambulances, local government, and NASCAR racing teams utilizing 800 MHz frequencies would become illegal; scanners receiving those frequencies would lose their type acceptance.

With the passage of HR2369, 83 percent of the 800 MHz public safety frequencies would be lost, drastically limiting the use of trunk tracking scanners. Would manufacturers find it worth their while to produce scanners—already a minor market—if they are forced to omit the frequencies of greatest interest?

The impact on news media is also obvious; there is a well-established liaison between the media and public safety organizations for news gathering. With monitoring of these services outlawed, such leads would become non-existent. Citizen reports to police agencies, enabling apprehension of suspects described over the air, would cease, crippling

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this source of leads. Citizen watch teams and off-duty firefighters who monitor with low-cost scanners would be a thing of the past.

Additionally, the Bill appears to prohibit the monitoring of other services not intended for public reception, apparently including many satellite services. Would we lose C and Ku band downlinks, NASA shuttle audio, perhaps even weather satellite monitoring? Amateur radio would be severely restricted, since transceivers could no longer incorporate wide-coverage receiver sections, severely handicapping Military Affiliate Radio Service (MARS), Civil Air Patrol (CAP), and other auxiliary public service efforts during natural disasters, plane crashes, and public welfare and morale communications.

The Bill is perplexing. Was it written by someone so inept and inexperienced that it is almost totally unusable? Does the writer simply not understand the radio spectrum and its users? Is the broad sweep intentional, designed for negotiational room with its opponents? Is it merely written to placate the CTIA so that, if it fails, the Subcommittee members can still tell their special interests, "Well, we tried!"?

Or is it really an intentionally punitive legislation, ineptly "designed by a committee," making their job easier by catering to their contributors and mandating the struggling FCC with its enforcement? This would be a characteristically simplistic, although unconscionable, solution to a complex technological problem.

■ Call to Action

We strongly believe in our citizens' right to privacy, but the onus of privacy protection is on the service provider, not the hapless hobbyist who could face an extended prison sentence and loss of his life savings after he overhears any one of an overwhelming number of clear voice transmissions.

Action on the Bill could come at any time—remember, the 1993 censoring of full-frequency-coverage scanners was deliberately added on as an eleventh-hour amendment to another Bill in front of a weary Congress eager to adjourn. If we allow this type of underhanded, PAC-funded manipulation to be repeated, we deserve to lose our traditional right of access to the airwaves.

Write, call, or e-mail your Congressional representative and voice your opposition to HR2369. We reprint a letter by Rachel Baughn as a sample; several other letters can be found at the KyScan web site <http://www.uky.edu/~hpeach/congress/locate.htm>

Tell your local news media they are also being targeted. Agent Kallstrom, FBI Assistant Director, NY Division, claimed monitoring by the press forced the Federal Bureau of Investigation to abandon use of cellular phones during the TWA 800 crash investigation. Laws already on the books prohibit such invasive listening.

This alleged incident and the improper

publication of Gingrich's phone conversation should not be used as justification for broadening the scope of "illegal" frequencies. To do so damages legitimate uses of radio and removes the responsibility from those who should bear it: the communications services which owe it to their customers to provide encryption, and those who are violating existing laws regarding use of radio communications.

Going to Bat for Radio Monitoring: A Suggested Letter to Congressmen

The Honorable _____
United States House of Representatives
Washington, D.C. 20515

The Honorable _____
United States Senate
Washington, D.C. 20510

Dear Representative/Senator,

I am writing to urge your opposition to HR 1964 (*The Communications Privacy and Consumer Empowerment Act*), which would ban radio scanners capable of reception of the commercial mobile radio services (CMRS), and to HR 2369 (*The Wireless Privacy Enhancement Act*), an even more repressive bill.

HR 2369 and HR 1964 both contain the same prohibition of CMRS in scanners. Millions of hobbyists who tune in local police, fire, rescue, NASCAR drivers, and other two-way radio traffic could be branded outlaws, just because they share frequencies with cellular and paging services. Simply listening to any of these currently-allowable communications would make you subject to imprisonment and a fine.

However, HR2369 goes even further to completely ban third-party reception of any non-broadcast radio reception, and the manufacture of receivers which can pick up non-broadcast signals. There are exceptions which may be extremely narrow or relatively generous, depending on how the FCC chooses to interpret the Bill's ambiguous language.

In its strictest reading, shortwave hobbyists could be criminalized for listening to anything other than broadcasts such as the BBC or amateur radio operators; even the 6-million C-band and Ku-band satellite dish owners may be subject to this law. The overly-broad language of this bill dumps the good along with the bad in its attempt to provide privacy to the evolving personal communications technologies.

The obligation to make communications private lies with the providers who are selling the service and the equipment, and they should be held to the promise they made eleven years ago to do so. It is already illegal for a third party to use information gained through interception of a non-broadcast signal for profit or to aid in a criminal act. I ask that offenders of existing laws be justly prosecuted; but don't penalize harmless hobbyists and public service volunteers by outlawing all two-way reception outside of CB and amateur radio.

Please oppose HR 1964 and HR 2369. If the intent of both bills is to enhance privacy in personal communications systems, they both miss the mark: HR 1964 does not take into consideration the enormous variety of services that utilize frequencies in the Commercial Mobile Radio Service. HR 2369 repeats the error and goes even further to give the U.S. the most repressive radio legislation in the free world.

Respectfully yours,
Rachel Baughn
Editor, Monitoring Times

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Selectable Atten. Yes
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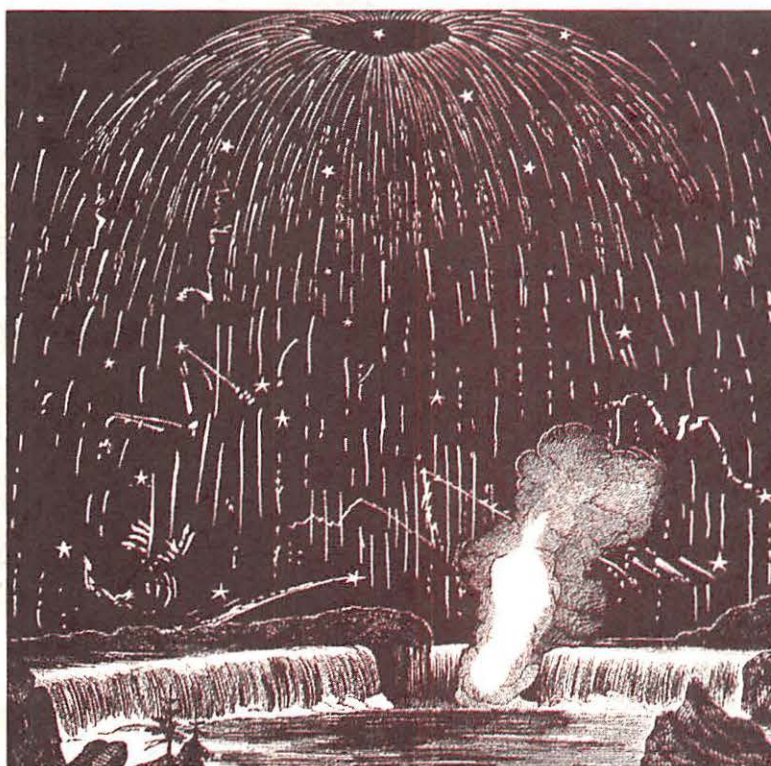
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Radio That's Really...



A woodcut illustrating the famous 1833 Leonid meteor storm.

OUT OF THIS WORLD

By Philip Gebhardt, VA3ACK

For decades, both radio professionals and radio enthusiasts sought ways to enhance desired signals while suppressing both extraneous signals and noise.

Some of that noise included extraterrestrial radiation: noise from the Sun, the planets and the Milky Way galaxy. Included in the unexplained sources were signals from meteors.

Eventually things turned around and radio antennas were pointed toward the sky to detect non-terrestrial signals. The result was the beginning of radio astronomy.

Unfortunately, radio astronomy is associated with huge parabolic antennas; expensive, sophisticated receivers; cooled, low-noise amplifiers; ultra low-loss transmission lines; and extremely high frequencies. In short, everything beyond the amateur enthusiast's reach. But, in fact, radio astronomy need not be expensive nor complicated for the amateur.

While most amateur radio astronomers are aware of the work of Karl Jansky and Grote Reber [1] in the 1930s, radio astronomy has even earlier roots. Researchers were using radio to detect meteors in the

1920s. H. Nagaoka appears to be the first scientist to suggest that meteors might cause sufficient disturbance in the E region of the ionosphere to affect radio waves. [2] Nagaoka's findings appeared in the *Proceedings of the Imperial Academy of Tokyo* in 1929.

Later, E. Quaeck and G.W. Pickard set out to find the connection between meteors and disturbances on long-distance shortwave transmissions. In Japan, T. Minohara and Y. Ito investigated the effect of the 1932 Leonid shower. Their work was followed up in India by S.K. Mitra, P. Syam, and B.N. Ghose during the 1932 Leonid shower. Work during the 1936 Leonid shower was carried out by J.N. Bhar and reported in the *Indian Journal of Physics and in Nature*.

As it turns out, there isn't a much easier project (these days) in radio astronomy than the radio detection of meteors. Just imagine—if Nagaoka could detect meteors using the technology and information available in the 1920s, how easy it should be for you to detect meteors with the receivers and antennas available today.

In fact, you may have already heard meteor signals on your shortwave, FM, or TV receiver without knowing what you were

hearing. Figure 1 shows what happens.

There is no better, more exciting time to get involved with radio astronomy than right now. Why? Because the Leonid meteor shower is about to peak. With a known period of about 33 years and the last recorded peak in 1965 and 1966, we are due for a spectacular return. How spectacular is spectacular? Robert Hawkes of the Physics, Engineering and Geology Department at Mount Allison University in Sackville, New Brunswick, states in the 1997 edition of *Observer's Handbook* [3] that for a one-hour, high-peak period during the 1966 Leonid shower, meteors were detected visually at the rate of 150,000 per hour! And if that doesn't impress you, P. Clay Sherrod makes the statement in *A Complete Manual of Amateur Astronomy* [4] that "...at some times as many as 500,000 per hour—140 per second—were seen."

The magic date this year will be November 17. However, the shower has a duration of four days, so you should listen at least two days before and after this date.

For radio enthusiasts, this is an opportunity to hear signals you might otherwise not be able to receive. It is also a simple way to learn about signal propagation and the ionosphere.

Although much of the available information is based on reception in the FM broadcast band, the lower VHF TV band (channels 2 through 6) and the 6- and 2-meter amateur radio bands, meteor detection has been successfully attempted as low as 6 MHz [5]. Powerful shortwave stations were used in the early days of meteor detection. Laurence Manning described [6] hearing the signal from a 50-kW, 15.340 MHz shortwave broadcast station on the night of September 16, 1946. Manning and other researchers were also using radar techniques and CW transmitters in their search for meteors.

Amateur radio operators have been involved since the early days. Oswald G. Villard, Jr., W6QYT, described a technique for hearing doppler whistles from meteor trails in a *QST* article [7].

Both Villard and Manning were associated with the Electronics Research Laboratory of the Department of Electrical Engineering at Stanford University during the days of meteor research.

Although interest in meteor detection and meteor communications waned as research funds dried up and satellite communications flourished, there has been a resurgence of interest and activity recently. This is an opportunity for radio enthusiasts to make a valuable contribution and enjoy the hobby at the same time.

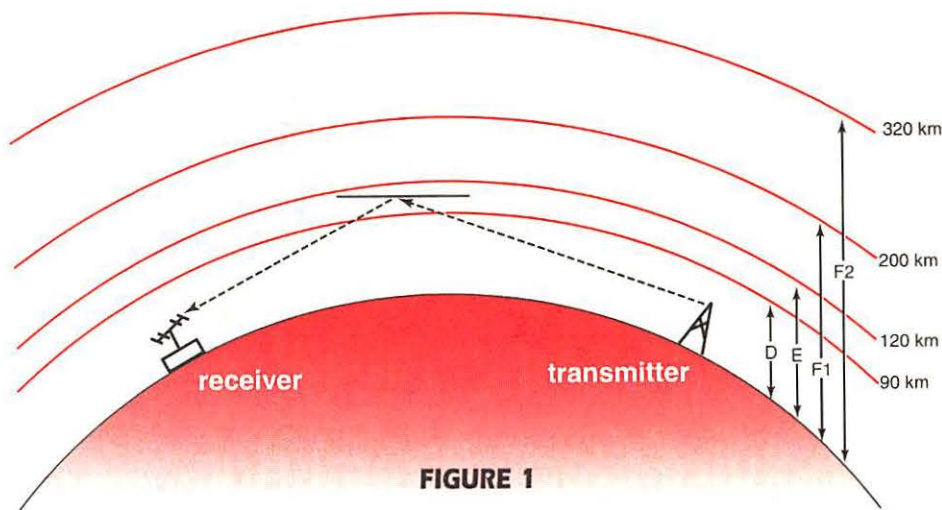


FIGURE 1
As a meteoroid enters Earth's atmosphere, it ablates at a height of 120 to 60 km. The meteoroid produces a meteor which includes a visible streak of light and an ionized column which can reflect radio signals. The height of the meteor is comparable to the E-layer of the ionosphere so FM and TV signals can be heard from distances similar to sporadic E signals.

■ Why Radioastronomy?

From an astronomer's perspective, the classic argument for the radio detection of meteors is that you can observe on nights when it is raining (or just cloudy). However, there are several other reasons to pursue radio detection techniques. Moonlight can impede visual observation, but not radio observation. There is also the problem of sunlight. No visual observations are possible during the day because the sky is generally too bright to see meteors. Radio detection, on the other hand, can be used night and day. As Gerald Hawkins put it, "...astronomers engaged in this work appreciate the full meaning of '24 hours per day, 365-1/4 days per year.'" [8]

There is also the consideration of what you can see and what your radio can hear. Table 1 shows the number of meteors which enter Earth's atmosphere each day classified by meteoroid particle size. Not only can you gather more information about meteors by radio observation than you can by visual observation because radio methods work 24 hours per day, but radio techniques can detect fainter meteors (weaker signals) than either visual or photographic methods. The end result is that on a typical night during which a visual observer might see perhaps 100 meteors, 500 to 1000 meteors can be recorded by radio means. [4]

And for those of us who live in the north, there's the added benefit of radio observing in the warmth of your radio shack rather than visual observing in the bitter cold outdoors. It may not seem important now, but next January you'll appreciate the difference!

So, how does this affect *MT* readers? Let's start with what you are listening for. Unlike

the Sun, Jupiter or other galactic sources which generate their own signals, meteors are passive reflectors of signals. Therefore, you won't be listening for crackles, hisses, or swishing sounds. You will be listening for terrestrial signals which are reflected by the meteor trail. (See Figure 1.)

As a meteoroid from outer space enters Earth's atmosphere, it not only produces the familiar streak of light known as a meteor (or shooting star), it also produces an ionized trail. John Pierce, a researcher in the early days of meteor detection by radio, estimated that a meteor weighing only one-quarter gram would produce an ionized trail 1 km (3280 ft.) in diameter and 100 km (60 mi.) long. Just like the ionized gases of the D, E, and F layers in the ionosphere, the ionized meteor trail is capable of reflecting terrestrial signals. As shown in Figure 1, a signal from a distant FM or TV station which is normally beyond listening range will be reflected by the ionized meteor trail and returned to Earth—and possibly to your FM or TV receiving antenna.

Just like the visual streak of light associated with meteors, the radio reflection takes place very quickly. It may last anywhere from a fraction of a second up to several seconds. Figure 2 shows the profile of a typical meteor-reflected signal. The signal rises very quickly out of the noise and then disappears quickly. About 90 percent of meteors follow this pattern. The other 10 percent will produce longer reflections—in some cases 15 to 30 seconds.

Although everyone's attention is on the upcoming Leonid meteor shower, you don't need to wait for a meteor shower to hear signals. Although there are dozens of major meteor showers each year, you can hear meteor signals any day of the year by listening for

TABLE 1: Properties of sporadic meteors

Sporadic meteor data. Many meteors enter Earth's atmosphere and ablate every day. Many are too small for visual detection, but can be detected by radio means. The mass distribution is such that the total mass of each of the particle sizes is constant. For example, notice in the table that each day 109 particles of 10-4 g mass ablate. However, during the same period 1010 particles of 10-5 g ablate. From this, it can be seen that the number of meteors detectable by radio means far exceeds the number detectable visually. Courtesy of Meteor Communications Corporation. Reprinted with permission.

		Mass (g)	Radius (cm)	Number Swept Up by Earth per Day
Particles that survive passage through Earth's atmosphere		10 ⁴	8	10
Visual and radio detection		10 ³	4	10 ²
		10 ²	2	10 ³
		10	0.8	10 ⁴
		1	0.4	10 ⁵
Particles totally disintegrated in Earth's upper atmosphere	Radio detection only	10 ⁻¹	0.2	10 ⁶
		10 ⁻²	0.08	10 ⁷
		10 ⁻³	0.04	10 ⁸
		10 ⁻⁴	0.02	10 ⁹
		10 ⁻⁵	0.008	10 ¹⁰
		10 ⁻⁶	0.004	10 ¹¹
		10 ⁻⁷	0.002	10 ¹²
Particles that can't be detected by radio		10 ⁻⁸ to 10 ⁻¹³	0.0004 to 0.0002	about 10 ²⁰

sporadic meteors. (For an explanation of sporadic meteors and meteor showers as well as other astronomy terms used in this article, see "An Astronomy Primer" accompanying this article.)

Meteor showers have the advantages that the meteoroids (within a single shower) are traveling along parallel paths and that, for the duration of the shower, the meteor rate is higher than it is for sporadic meteors. As a result, you have more chance that successive meteors in the shower will continue the reflection process and you will be able to hear the reflected signal for a longer period than a second or two.

Table 2 gives data for some upcoming showers to get you started.

While meteor showers occur annually at predictable times, sporadic meteors appear at unpredictable times from unpredictable directions in the sky. Nevertheless, there is a predictable daily variation in the number of sporadic meteors detected. As shown in Figure 3, a peak in the number occurs in the early morning hours (normally around 6 a.m. local time) as meteoroids are swept up by Earth. A minimum occurs in early evening (about 6 p.m. local time).

It should be noted that in overall numbers, sporadic meteors outnumber shower meteors by 4 to 1.

■ How, Where, and When?

Now that you know how meteors reflect terrestrial radio signals and what you are listening for, you'll need to know how to hear the signals, where to listen and when to listen.

The "how" part is easy: Turn on your FM receiver and listen. Well, it's perhaps not quite that easy, but almost. Select a clear

frequency in the FM broadcast band. Remember that in North America the band starts at 88 MHz and ends at 108 MHz. However, the lowest assigned frequency is 88.1 MHz and the highest frequency is 107.9 MHz. Frequencies are assigned at 200 kHz intervals, that is 88.3, 88.5, 88.7 MHz and so on. In North America, there are no stations on 88.2 MHz, for example. Tuning to a frequency used by a local station is easy; tuning to a frequency on which there is no station to be heard can be tricky. Having a receiver with a digital read-out makes the task easy. If you use a receiver with a dial and pointer, you'll need to estimate where the frequency is on the dial.

If you live in a large metropolitan area where clear frequencies are as scarce as hen's teeth, you may have to settle for a frequency with a weak signal.

You can connect an FM or FM/TV outdoor beam to your receiver. If you subscribe to cable TV and don't have an outdoor antenna on a tower, you can connect a dipole or folded dipole to your FM receiver. (See Figure 4.)

But where do you aim the antenna? If you

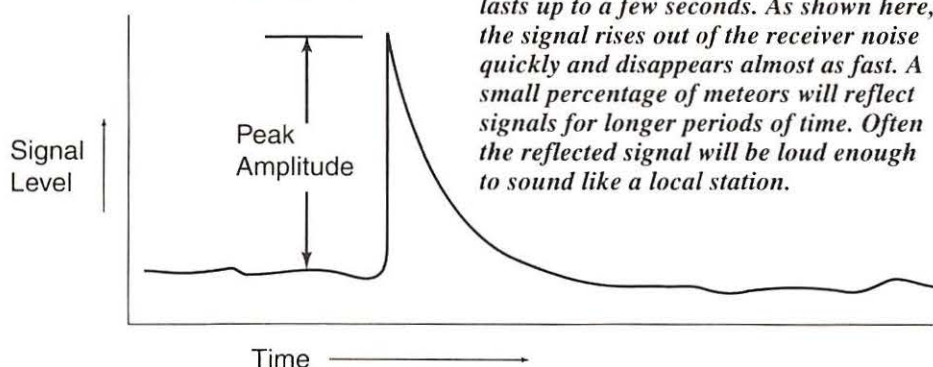
use a dipole and you want to detect sporadic meteors, string the antenna in an east-west direction so your best reception will be north-south. This also applies to a folded dipole and to the collinear antenna.) If you use a beam antenna, point the antenna south.

Now you can sit back (early in the morning for best results) and listen for sporadic meteors. You'll know when you hear a meteor, because the signal will quickly rise out of the noise and then disappear. You may hear a few notes of music or a few words. If you couldn't find a clear frequency and had to choose one with a weak, background station, you may find that the weak signal is enhanced briefly. In other cases, the weak signal will be momentarily swamped by another, more distant station.

When detecting sporadic meteors, the type of antenna you choose is academic. Beam antennas have higher gain than dipoles and therefore allow you to hear fainter meteors. On the other hand, beam antennas achieve gain by sacrificing beamwidth and so they 'see' less of the sky than dipoles do. Conversely, dipoles can only detect strong meteors, but because dipoles 'see' more of the sky, they detect strong meteors that are outside the beam of an FM beam antenna. Depending on your location and the time of day, the advantages of beams and dipoles balance out. In studies of meteor velocity conducted by Villard, Manning, and Peterson at Stanford University, a half-wave dipole mounted a quarter-wavelength above the ground was used as a receiving antenna. [2]

Beam antennas have the advantage when it comes to meteor showers. That's because these meteor trails reflect signals from predictable directions.

If you are using an FM or FM/TV beam on a tower, you can leave the antenna pointed at the horizon just as you would for normal reception. If you are considering dedicating a beam antenna to meteor detection, you might

FIGURE 2

The signal reflected by most meteor trails lasts up to a few seconds. As shown here, the signal rises out of the receiver noise quickly and disappears almost as fast. A small percentage of meteors will reflect signals for longer periods of time. Often the reflected signal will be loud enough to sound like a local station.

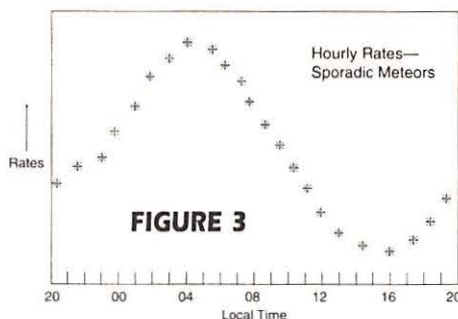


FIGURE 3

The rate at which sporadic meteors are detected varies throughout the day. The diurnal variation shown here clearly shows the maximum and minimum times as described by McKinley and Millman in their research [12]. Note that the detection rate does not drop to zero, but simply to a minimum value in the early evening.

consider setting the antenna at an elevation angle at 45° above the horizon. Japanese astronomers in the Nippon Meteor Society even pointed their beams straight up [9] to reduce noise from terrestrial sources.

You can get results using a 4-element beam; the Nippon Meteor Society astronomers used 5- and 7-element beams.

If you want to detect showers other than those listed in Table 2, you need to determine where to point your beam. You'll need a planisphere or a computer program designed for meteor work. Michael Owen, W9IP/2, has written one such program—aptly named

Meteor—which is available on the Internet or through amateur radio BBSs.

Using a planisphere, you can track the meteor's radiant as it travels across the sky. The best time to listen is when the radiant is between 30° and 60° above the horizon. The best direction to point your beam depends on the meteor's radiant. When the radiant is in the northeastern sky, listen for stations from the northwest and southeast. When the radiant is in the northern sky, listen for stations from the east and west. When the radiant is in the northwestern sky, listen for stations from the northeast and southwest. This pattern continues around the compass.

Using this technique, you will need to know where the meteor radiant is. An astronomy reference, such as *Observer's Handbook* [2], will provide you with the required information. Alternatively, visit the International Meteor Organization's web site (<http://www.imo.net>) where you will find information about meteor detection. To obtain information about specific showers look up their calendar (<http://www.imo.net/calendar/cal97.html>) where you will find information about meteor showers in general as well as daytime (radio) showers.

Although much of this article has focused on the FM broadcast band, the detection method applies equally well to the lower VHF TV band (channels 2 to 6).

There are two points to keep in mind. First, if you opt to listen on the FM band and use a TV beam, verify that an FM trap has not been inserted in the feedline. If there is one, remove it. Second, receiving meteor signals on a TV receiver precludes using cable TV. There will be no unoccupied channels to monitor, if you connect to cable.

Although listening on the FM or TV band is a compromise, they have major advantages. First, many stations are running high power—25, 50, or 100 kW. The strength of the reflected signal and the duration of the signal are dependent on transmitter power and transmitter antenna gain. Second, many FM and TV stations operate 24 hours a day. This means you should be able to hear a signal whenever a suitably-positioned meteor trail forms. Some of the early meteor research was conducted in the 60-70 MHz range. [10]

It is possible, and from a theoretical perspective desirable, to listen on lower frequencies. It's "theoretical" because you won't find any high-power stations with predictable schedules until the frequency dips to the international shortwave broadcast bands. You can listen to the mobile band (29.7-50 MHz), but transmitter power is low and operating times are unpredictable. The 10-meter amateur radio band is well-suited to meteor detection and communication—amateurs can use 1000 watts and Villard, Manning, and Peterson used CW transmissions on 23.1 and 30.66 MHz in their tests. [11] Unfortunately, the 10-meter band is underutilized for meteor work. (See "Investigating Meteoric Radio Reflections on 10 Meters" accompanying this article.) You can miss a lot of meteors while no one is transmitting!

The distance between you and the station you hear depends on your receiver and antenna. Using a beam antenna on a high tower pointed at the horizon, you can expect to hear

TABLE 2: Meteor shower data

Meteor shower data for selected 1997 showers. Although emphasis is often placed on peak dates, many showers last for several days. The duration of a shower is defined as the period during which the activity is 1/4 peak or more. For these showers, detection should be attempted on several days. The directions listed in the Optimum Path columns indicate the directions from which signals can be received at your location. The times in these columns should be considered as broad guidelines only.

Shower	Peak Date/ Time (Note 1)	Duration (days)	Optimum Path (Note 2)	NW-SE	E-W	SW-NE
			N-S			
Orionids	Oct 22 1h	8	0000-0200 0600-0800	0430-0800	0330-0430	0200-0330
S Taurids	Nov 3 1h	30	2230-2330 0500-0600	0330-0430	0400-0530	2300-0100
N Taurids	Nov 13 0h	30	2300-0030 0530-0700	0500-0630	-	2330-0030
Leonids	Nov 17 11h	4	2200-2330 0500-0630	0430-0530	-	2300-0000
Geminids	Dec 14 6h	3	2000-2200 0330-0530	2130-2300	-	0500-0630
Ursids	Dec 22 12h	2	-	1830-2030	1900-2330 0130-0900 1600-1830	0500-0700

Note 1 - Peak dates in Table 2 are given as UT to conform with standard astronomy practice and to match similar data from other sources.

Note 2 - Optimum times in Table 2 are given as local standard time to facilitate use of the table by listeners throughout North America.

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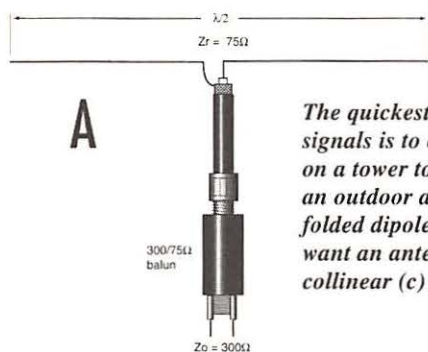
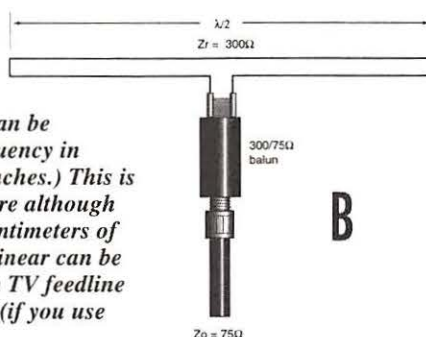


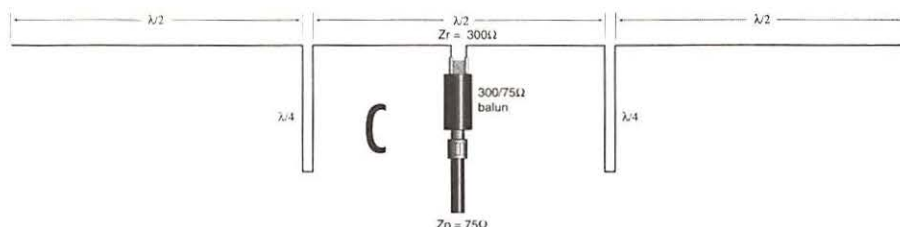
FIGURE 4

The quickest way to get set up to listen for meteor signals is to connect an outdoor FM or FM/TV beam on a tower to your receiver. For those who do not have an outdoor antenna, a simple, half-wave dipole (a) or a folded dipole (b) will bring in signals. For those who want an antenna with a little gain, the 3-element collinear (c) can be used.



In each case, the length $l/2$ in centimeters can be calculated using $14550/f$ where f is the frequency in MHz. (Use $5728/f$ if you prefer to work in inches.) This is based on the use of #14 solid or stranded wire although other sizes can be used. The length $l/4$ in centimeters of the two phasing stubs for the 3-element collinear can be calculated using $4950/f$ (if you use 300-ohm TV feedline with solid polyethylene dielectric) or $7125/f$ (if you use open-wire parallel line).

For inches, use $1949/f$ and $2805/f$ respectively. A 300/75-ohm balun as shown can be used to convert between 75-ohm antennas and 300-ohm receiver input or 300-ohm antennas and 75-ohm receiver input. If the antenna impedance (Z_r) and the receiver input (Z_o) match, you won't need the balun.



stations between 1300 and 2000 km (800 and 1250 mi.) away. An antenna which will receive signals from a higher angle of radiation (such as a half-wave dipole) will enable you to hear closer stations.

As Laurence Manning did in 1946, you can try listening for shortwave stations via meteor trail reflection. The station cannot be more than 2000 km away (and preferably it should be closer); however, it must be far enough away that you cannot receive any more than a weak groundwave signal. In addition, you must be listening at a time when normal F-layer propagation between you and the station is not a possibility. Since there would be no reason for a shortwave station to be on the air if F-layer propagation was not present, this dictates that you must be inside the skip zone. (Outside the skip zone, the station's signal will be so strong, it will mask any meteor signals.) If you try this approach, start with stations in the 13-meter band. Later, you can try stations on 16- and perhaps 19-meters.

Now, with all this talk of research at

Stanford University and scientists trying to determine the connection between meteors and shortwave communications, you might think that meteor detection is simply an academic pursuit—something that only researchers would be interested in.

Not so. There are practical applications that have made all this "time well spent" as they say on A&E.

There were military applications for communications via meteor trails until satellites came along. But there are other uses too. One company—Meteor Communications Corporation—uses meteor burst communications (MBC) in applications where very low data rate and waiting time do not present problems. By low data rate, they mean tens to hundreds of bits per second. Using this technique, the company can send data over links up to 1600 km (1000 mi.).

Applications include the remote sensing of meteorological and seismic conditions. One system monitors snowfall and accumulated snowfall.

MBC transmitters run 100 to 10000 watts into yagi or log periodic antennas. Although lower frequencies would produce longer echoes and higher amplitude echoes, frequencies in the 40-50 MHz range are used to avoid problems with multipathing and fading associated with the HF bands. While frequencies above 50 MHz have the advantage of smaller antenna size, these higher frequencies are subject to higher path loss.

In one system, a master transmitter sends out a continuous signal to the remote site. When a meteor trail appears, the remote site senses the reflected signal and it in turn transmits a burst of data.

Amateur radio operators have played a major role in meteor communications and many still attempt communications via meteors. In the past, amateurs used the 'message piecing' technique. That is, one station would repeatedly send a message and the receiving station would piece together the information until the contact could be confirmed. Recently however, amateurs have applied packet radio techniques to meteor communications.

A little practice with sporadic meteors and the Orionid meteor shower will prepare you for the possibility of a spectacular show during the Leonids over the next few years.

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Investigating Meteoric Radio Reflections on 10 Meters

One way to learn about meteor detection is to follow the lead of the pioneers and experts.

Some of the experiments are within the capabilities of beginners; others are not. The ones which are best left out are those which rely on radar techniques.

There are many "easy" techniques to investigate, however. This fall and winter, I will attempt several meteor activities with the assistance of Ontario DX Association members. You can try some on your own or help us with ours by listening for our signal and sending reports.

You can start by monitoring sporadic meteors. You can record the reflected signals on audio tape, strip chart paper, or your computer. You can then produce your own graphs of daily mean hourly rates of reflected signals. A variation of this is to produce a graph of average monthly median echoes per hour.

Similarly, you can select a meteor shower and determine the average hourly rate at which you detect meteors during the shower. This information can stand on its own or be compared to the daily mean hourly rate for sporadic meteors.

My planned activities include detecting meteor whistles. Using the amateur radio callsign VE3ACK, a CW signal will be transmitted on 29.050 MHz each Saturday and Sunday morning between 5 a.m. and 7 a.m. EST during October, November, and December. As with the experiment conducted by Villard, Manning, and Peterson at Stanford University, the output of the transmitter will feed a half-wave dipole. A similar dipole will be used at the receiver site several kilometers away. Although we will be listening for whistles, we will welcome reports from anyone who hears the signal.

We will also be transmitting during several meteor showers, including the Leonids in November. However, our major shower

activity will take place during the Geminids (December 13-15).

A possible meteor shower activity which we will undertake (and which you can attempt as well) is to set up two beam antennas (preferably narrow-beam antennas) pointing at the horizon. The antennas will differ in azimuth by 30°. As Earth rotates, a large number of echoes will first appear in Antenna 1 indicating the presence of a group of meteors (the shower). As Earth continues to rotate, activity in Antenna 1 will diminish and echoes will be heard in Antenna 2. The transfer of activity from Antenna 1 to Antenna 2 confirms the existence of the meteor stream. This method was used primarily for studies of major showers, such as the Perseids or the Geminids.

For updates on VE3ACK meteor activity, frequencies, and dates, visit the ODXA web site-<http://www.grove.net/~odxa/>

AN ASTRONOMY PRIMER

The following list of astronomy terms will explain the terms used in this article as well as terms related to meteors that you will encounter in astronomy books and articles.

Declination: just as you can locate any point on Earth by specifying its longitude and latitude, you can locate a star (or in the case of meteor showers, a radiant) by specifying the right ascension and declination on the celestial sphere. Right ascension is given in hours and minutes; declination is given in degrees. For example, for the Leonid meteor shower, the right ascension (a) is 10h 11m and the declination (d) is +22°.

Duration: most meteor showers last for several days. The duration is the period during which the meteor rate is 1/4 or more of the rate at the peak date and time.

Meteor: the streak of light (and related phenomena such as ionization) produced when a meteoroid enters Earth's atmosphere

Meteoroid: an interplanetary particle which may be as small as 10-13 g or as large as 104 g. When a meteoroid enters Earth's atmosphere, it ablates at 120-60 km above Earth and produces a meteor.

Meteor stream: a group of meteoroids traveling in highly correlated orbits (parallel paths)

Meteor shower: the increased meteor rate which occurs when Earth intersects a meteor stream

Peak date and time: the date and time (in UT) at which the meteor rate will be maximum. Note that in astronomy, the time scale used is UT not UTC. They are closely related however, so don't fret about resetting your clock depending on whether you are listening to the BBC World Service or listening to meteors.

Planisphere: a chart of the sky showing the location of stars and constellations. The chart has a clear, plastic overlay which turns so you can set the date and time to get a view of the sky as it appears at that time.

Radiant: due to perspective, the parallel paths of meteors during a shower appear to meet at a point in the sky called the radiant. (The effect is similar to parallel railway tracks that appear to meet in the distance.) The meteor shower is usually named for the constellation in which the radiant is located. For example, the Leonids' radiant is in the constellation Leo; the Perseids' radiant is in the constellation Perseus.

Right ascension: see Declination above

Sporadic meteor: a meteor produced by a random meteoroid traveling through space on its own

EMERGENCY MEDICAL SERVICES



Story and photos by Ed Muro

Transforming Health Care One Life at a Time



The Star of Life was registered in 1977 by NHTSA. Each of the six "points" of the star represents an aspect of the EMS System: detection, reporting, response, on scene care, care in transit, and transfer to definitive care. The staff represents medicine and healing.

As the piercing sounds of sirens wail in the air everyone within earshot knows someone is in need of dire assistance. With today's EMS system in place, we can be assured help is on the way. That help—often volunteer help—saves lives. Its availability depends on full community support.

The Emergency Medical Services System is the newest profession in the public safety family which includes fire protection services and the police department. This vital community service receives around 15 million calls each year for emergency medical aid. It has been said that the average American will have to summon the Emergency Medical Service twice in their lifetime.

Until the mid-sixties, ambulances were little more than fast moving meat wagons. They afforded very little medical care and only promised rapid transit to a hospital. The only requirement for the job was to be able to drive well at high speeds and to be strong enough to lift the stretcher.

However, advances in medical technology—much of it pioneered during the Vietnam conflict—led to great changes in how patients were transported to hospitals. These gains made it possible to deliver more care at the scene of an emergency and on the way to the hospital. It also created the need for more highly trained personnel to operate a cohesive system.

■ National Standards are Set

Recognizing this, the Congress directed the U.S. Department of Transportation to establish national EMS standards. In 1966, the National Highway Safety Act was enacted, which included funds and standards for the EMS system. The resulting curriculum of instruction and clinical experience, now averaging about 110 hours nationwide, has become the principle model for the basic training of Emergency Medical Technicians (EMTs).

Noting that EMS is an entirely new service in the civilian structure of this nation, the National Highway Traffic Safety Administration declared that it was imperative that EMS be distinctly identified for the benefit of not only those working in the service but also the general public. Thus, in 1973 the "Star of Life" became the officially recognized insignia of EMS personnel and equipment on a national basis.

Although often the first to arrive at the scene of an emergency, EMTs sometimes find that emergency care has already been started by a first responder, such as a fire fighter, police officer, or other official trained in CPR, First Aid, and other basic life support techniques. Last year the New York City Fire Department implemented its own first responder program by training members from several engine companies as EMTs, in order to supplement the city's ability to provide timely care.

■ Standard Procedure

On the scene, responsibility for a victim is assigned to the EMT with the highest certification. In New York State there are several levels and they are basically the same in other states.

LEVELS OF CERTIFICATION

- EMT: Emergency Medical Technician: Includes basic Life Support Skills and the ability to extract victims from vehicles.
- AMT (Or A-EMT): not really used anymore, it means Advanced EMT; may or may not be a paramedic.
- EMT-CC: EMT-Critical Care: that's the new name for AMT, at least in N.Y. State.
- EMT-P: EMT-Paramedic, self explanatory

An EMT does BLS, or Basic Life Support. That's basically making sure that the "ABCs" are covered Airway, Breathing & Circulation. This is done with mouth to mouth (rarely now), CPR, bandages, splints, and oxygen.

An EMT-CC or EMT-P does both BLS and ALS (advanced life support). Advanced life support includes intravenous lines (IVs), Endotracheal tubes (ETs), administering medication by IV or injection, EKG cardiac monitoring, etc.

■ Critical Communications

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the fire department or police department, but it, too, carries life and death significance. The Emergency Medical Service has become the third leg of the triad of Police, Fire, and EMS services. It is an indispensable service to the security of all U.S. residents.

While there are many frequencies used to dispatch life support services around the country (refer to your favorite local frequency directory for the frequencies in use in your area), once on their way with a patient in transit to the hospital many ambulances use **standardized national frequencies** set aside for biomedical telemetry. Commonly referred to as Med-1 through Med-8, the frequencies are:

Used on a nationwide basis:

Ch:	Base:	Mobile:
Med-1	463.00	468.00
Med-2	463.025	468.025
Med-3	463.050	468.050
Med-4	463.075	468.075
Med-5	463.100	468.100
Med-6	463.125	468.125
Med-7	463.150	468.150
Med-8	463.175	468.175

Popular EMS dispatch frequencies used in the New York Metro Area Nassau County, New York:

Fire Department Ambulances:	46.100 (Countywide Dispatch: FireCom)
Volunteer Ambulance Corps:	154.115
(Atlantic Beach, Malverne, Mineola, Wantagh-Levittown Ambulance Dispatch)	
Bellmore-Merrick Ambulance	37.94
Garden City Ambulance	155.340
Emergency Ambulance Service Corp.	463.300
Five Counties Ambulance Service	47.54
TransCare Ambulance	935.0125-939.9875
	(trunked system)
Med-Com* (Medical Control)	462.975
Police Ambulances are dispatched on local police precinct frequencies	

* Both Police Ambulances and Volunteer Ambulances notify Med-Com of the patients vital signs when in transit to the hospital. They also inform Med-Com of what hospital they are transporting to. Med-Com then notifies the appropriate hospital of the incoming patient. Med-Com's HQ is located at the Nassau County Medical Center (NCMC), where there is staff on hand to instruct the paramedics on what procedures to take should it be necessary. However, even though the headquarters is located at NCMC, not all patients are transported to that facility.

Suffolk County, New York:

155.235	Commack Volunteer Ambulance Corps
155.280	Med-Com (County EMS Dispatch)1
155.325	M.C.I.
155.400	Central Islip V.A.C.
155.175	Huntington Community F.A.S./
	B.S.B.R.W.VAC
Other Freqs:	154.325, 154.385, & 154.415

Putnam County EMS Services:

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As EMS becomes an increasingly important part of our medical system, so has interest in its communications increased. Volunteers, first-responders, shut-ins, off-duty personnel and an ever-growing number of private citizens regularly tune in local EMS radio traffic.

New York City:

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New York City Fire Dept Division of Emergency Medical Services:

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Brooklyn South & Staten Island	854.987 (Conventional)
Brooklyn Central	477.862
Brooklyn North	478.262
Queens	478.262
Bronx North	478.212
Bronx South	477.837
Manhattan South	860.737 (Conventional)
Manhattan North	855.487
Manhattan Central	856-860.987 (Trunked)



SHORTWAVE & SATELLITES CYBERSPACE

By George Wood

Satellites have completely changed international broadcasting. That much is uncontroversial. Whether the change has been for the better depends on who you are. I have a feeling lot of shortwave listeners and hardcore DXers are not terribly pleased about how satellites have changed their hobby over the past ten years or so. Certainly when "Sweden Calling DXers" turned into "MediaScan" and shifted its focus from shortwave to satellites, there were a lot of letters denouncing the change.

But for a broadcaster, satellites are wonderful.

For years we've struggled with sunspots and the ionosphere, shifting frequencies to follow the illusive whims of propagation or to avoid accidental or intentional interference. Now, not only can our programs appear on listeners' receivers in perfect FM quality, but thanks to satellites, they are also reaching far more listeners directly or via rebroadcasts from local radio stations and cable systems.

We can also turn off some of those huge 500 kilowatt shortwave transmitters that have been consuming massive amounts of electricity, and rely instead on much lower-powered uplinks and solar-powered space downlinks.

For the sake of the planet's resources, satellites are wonderful.

With so many shortwave broadcasters moving to satellites, the overcrowded shortwave spectrum is opening up, making it

possible to hear the more exotic stations that used to be under the interference before. After all, most DXers don't seem to care much about listening to "easy" European broadcasters, they hunt for the rare signals from little transmitters in the tropics.

However, even the "easy" stations have a few programs of interest. One of the first applications of satellites to international broadcasting was to provide direct links to relay stations. That meant that Radio Netherlands could broadcast live from its studios in Hilversum, rather than send tapes for rebroadcast three weeks later. *DX Jukebox* became *Media Network*, with up-to-the-minute news about unusual new stations or shifting propagation. Similar programs like Glenn Hauser's *World of Radio* or the VOA's *Communica-*

tions World suddenly became accessible in Europe and other locations where shortwave reception had been difficult. There's also a whole new hobby hunting satellite DX and on-the-spot news feeds.

For DXers, satellites are wonderful.

■ The End of the Cold War & the Beginning of the Satellite Era

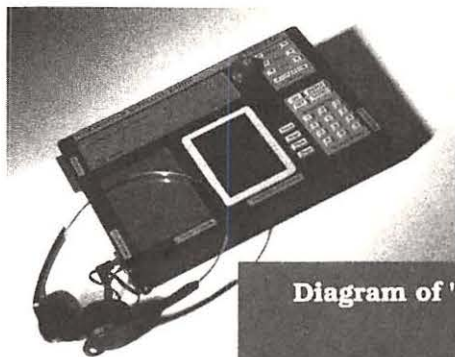
Aside from feeds to relay stations by major broadcasters like the BBC World Service, VOA, Deutsche Welle, and Radio Netherlands, the real impact of satellites on international broadcasting came in Europe at about the same time the Cold War was ending, in the early 90's. With the launch first of satellites from Eutelsat, followed by the first Astra

satellites, several radio signals could ride along on each TV transponder. Suddenly there was a relatively inexpensive way to reach all of Europe with an FM quality signal. For European shortwave broadcasters this seemed too good to be true.

In a way it was. It turned out that there were a number of problems. For one thing, the audience was different. Shortwave listeners are a hobbyist community, and shortwave programming was designed for them, cozy, not terribly slick, and put together with potential poor conditions, interference, and fading in mind. Satellite listeners were perceived, in con-

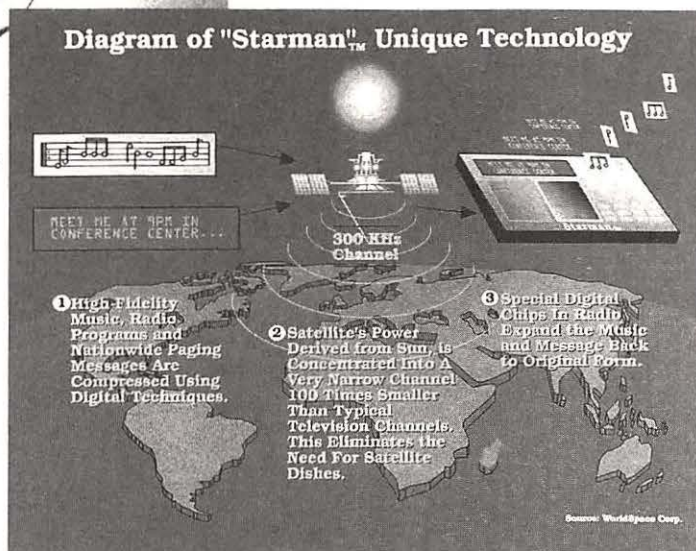


Although the BBC is deeply interested in alternative methods of delivery, it remains committed to shortwave broadcasting. Shown is the BBC's Asia relay station in Thailand.



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for the satellite audience didn't work out. Partly it was a matter of resources, as you just couldn't do twice as much radio with fewer people. But it also turned out that the satellite audience was not as "normal" as management



trast, to be "normal" people, not hobbyists. Radio Sweden's management decided that the satellite program format had to sound more like domestic radio, and suddenly we were ordered to produce extra satellite shows in a new format, with the same staff resources, or less.

Less...that was the other repercussion of the end of the Cold War. Military budgets were slashed, but it also turned out that shortwave radio was considered by some politicians to be an obsolete remnant of the struggle between East and West, whose purpose had gone the way of the Berlin Wall. Across Europe and North America, funds for international broadcasting were cut back. Since satellite transponder rental was cheaper than the electricity burned up by half a megawatt shortwave transmitters, one way a station could reduce costs was to switch to satellite delivery.

Radio Finland is a good example of a small station that's gotten heavily involved in satellites, yet still relies on shortwave. But Managing Director Juhani Niinistö says he's not about to give up shortwave completely:

"The two forms of delivery complement each other. Satellite reception is for fixed location listening only, while shortwave offers mobility. The individual tourist will carry a portable SW for immediate news service, but may also enjoy hi-fi radio in his or her hotel, delivered by satellite."

At Radio Sweden separate programming

first thought. A particular part of the general population bought satellite dishes, and then most of them just watched TV. The few who did explore the opportunities on radio turned out to be another kind of hobbyist, not that much different from the SWLs (shortwave listener) and DXers (a person who listens for distant shortwave stations) on shortwave.

The satellite turned out to be just another type of transmitter.

Thoughts turned from using satellites directly to reach listeners, to using them instead to feed local stations for rebroadcasting. For years shortwave stations have had Transcription Services, sending recorded programs on tape to stations around the world. (Back when I worked in college radio at UC Santa Barbara, we loved this stuff, since once we'd played the programs, we could erase the reels and avoid having to buy new tape.)

Satellites could deliver programs in real time to stations providing up-to-the-minute news, rather than "timeless" features. At many international broadcasters, the overall programming format began to gradually change, away from the cozy shortwave community of the past towards something a little more modern and fast-paced; something that fitted in on local stations, yet hopefully still worked on shortwave.

Initially there was a bonanza for some of the larger stations. As Eastern European countries regained their freedom, the airwaves opened up and people hungered for uncen-

sored news and entertainment from abroad. In the early days it was easy for stations like the Voice of America, Radio Free Europe, or the BBC—which had been regarded as friends during the decades of repression—to acquire local transmitters in the former Warsaw Pact countries. Satellites made relays from home countries possible. But this brief era had to end.

As the new democracies rediscovered and rebuilt their journalistic traditions, there was more interest in their own stations, and less in listening to outsiders, no matter how important those voices had been during the years of darkness. The disappearance earlier this year of VOA Europe, which had mixed American rock with news and features from Washington, marked the end of that era.

North America was hard to get into as well. There was the NPR satellite system, of course. If you could get your signal across the Atlantic (which was still expensive in the days before ISDN), you could pay NPR to put your programs on the satellite. But there was no guarantee at all that the local affiliates, faced with 16 channels of audio from NPR, American Public Radio (now PRI), and numerous independent producers, would run the material from abroad. A number of stations bought time anyway. Others booked ordinary audio channels on regular TV transponders and hoped some of the 1 or 2 million TVRO fans would listen in.

Then there was cable. Cable systems were already well established in North America, and were opening up across Europe, in connection with the satellite explosion that brought in so many new TV stations from around the world. Most cable networks carry radio, although that side of the operation is not always well-developed in Europe.

The problem was that only the major broadcasters like the BBC, Radio France, and Deutsche Welle could afford 24 hour services in a single language. Smaller stations leased a single sound channel to carry their entire output in a variety of languages. But no cable system was likely to relay a channel that switched every half hour from English to French to German to Russian, etc. A cable network in Britain would want a 24 hour channel in English, just as the Paris cable system would only be interested in relaying a 24 channel in French.

Even direct satellite listeners may object to the multi-lingual approach. Radio Finland's Juhani Niinistö comments: "I have a letter on my desk from a Finnish professor demanding an explanation for why we air French on our Eutelsat channel...I will try to explain it to him."

Swiss Radio International took the ambitious route. It was easy to set up 24 hour satellite channels in the country's national languages, German, French, and Italian. But SRI expanded its English programming as well into a 24 hour operation.

Most smaller stations couldn't afford that kind of expansion. The solution, best expressed by Uwe Schoop, then head of the Swedish service at Deutschlandfunk, who called it "time-sharing," was for stations to get together to put all their programs in a single language on one satellite sound channel. The idea was obvious; the only problem was doing it, considering the nature of European public broadcasting. Large media bureaucracies just couldn't work together that way.

The "Gang of Four" of Radio Netherlands, Radio Sweden, Radio Canada International, and Swiss Radio International discussed the idea, but couldn't agree on its implementation. The European Broadcasting Union belatedly set up a special forum for international broadcasters, which also talked about the concept, but couldn't make anything happen either.

Who would run the system? Who would decide who got to broadcast in prime time? How would costs be divided up? Who would pay for lines to the uplink site? There were lots of questions, and no experience in actually working together on that level.

■ WRN Runs With the Ball

In the end, three defectors from the BBC made it happen. Karl Miosga, Jeff Cohen, and Tim Ashburner kept their day jobs while they talked to stations about their World Radio Network. They got UPI to provide temporary facilities by doing some work for them, and talked British Sky Broadcasting into providing a free sound channel as a test. For a week stations from all over Europe, and as far away as Israel and India, shared a common satellite channel. The signals poured into a tiny room at UPI's headquarters in London's Docklands by satellite link, expensive broadcast circuits, ISDN, and even off shortwave.

It looked like chaos with cables running everywhere into equipment just patched together for the week, but it worked. Some weeks later, supported by a contract from National Public Radio to bring its programs to Europe, WRN Network One went on the air on Astra, relaying some 20 international broadcasters. Separate deals to relay Vatican Radio and Radio Canada International/CBC to Europe followed. Then WRN turned towards North America, and began relaying its European broadcasters on the WTBS transponder

on Galaxy 5. That was followed by a second channel, WRN 2, which turned things inside out by carrying programs in various stations' native languages for their nationals in North America.

C-SPAN has relayed international broadcasters on its Secondary Audio Programs for several years: one channel for the BBC World Service, another for a variety of stations, most of which have been available in North America via some satellite relay. Recently, several

hours a day of that service has relied on WRN 1.

One of WRN's biggest successes was talking Canada's CBC, beset by budget cutbacks, into taking the WRN 1 service to provide all-night programming on one of its national AM networks. Suddenly international broadcasters really were being heard by "normal" people, that is, normal insomniacs and normal night shift workers. (This has had interesting repercussions. One way Radio Sweden has dealt

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with budget cutbacks has been to regularly recycle various interviews and reports. That's worked on shortwave, where few people seem to listen to every broadcast. But numerous complaints about the repeats have come in from the Canadian night owls.)

More recently, WRN has expanded to Africa and Asia. The African service is on Intelsat 707, and is then relayed on the Multichoice DBS package on PAS-4. A deal similar to that with CBC Overnight has been worked out, and WRN I programs are carried in the middle of night across South Africa on a national network called SAfm.

The Asian service is part of a package of European radio broadcasters on Asiasat-2. Both the African and Asian relays differ from those to Europe and North America in that they are digital. That means right now the average home listener can't tune in. Instead they are intended for local and cable rebroadcasts.

I've devoted a lot of space to the World Radio Network story, because WRN is probably the most important tool for smaller international broadcasters to reach listeners on satellite. There's simply nothing better right now. The larger broadcasters, of course, have their own 24 hour channels. NPR was so pleased with its response in Europe that it leased its own channel, America One, together with PRI. However, both continue to provide programming on WRN as well.

■ The New Generation Broadcasters

The international radio broadcasters currently on satellite have all started with shortwave. But the coming digital age in broadcasting will see new stations that have never used any other medium. Europe is just introducing Digital Audio Broadcasting. The first regular transmissions began in September 1995 in Britain and Sweden. Canada, Denmark, Norway, Finland, Germany, France, and Belgium have all followed suit, and DAB is also testing or planned in the rest of Western Europe, India, Australia, and Russia.

European services are not expected to take off until the first consumer receivers arrive on the market this fall. Ultimately, DAB receivers will pick up transmissions from both terrestrial and satellite transmitters. In preparation for this, the BBC World Service, Deutsche Welle, Radio Netherlands, and Radio France International have, together with a number of smaller stations, organized EuroDAB. Right now the co-operation involves a number of weekly programs called Radio E carried on satellite and shortwave by the stations involved. The intention is to provide WRN-type

services in English, German, and French that would run on DAB channels in each of the participating countries, as well as via satellite.

This goal seems rather remote, as DAB spectrum will be limited until the FM band is phased out after the turn of the century: most countries will be filling their current DAB allocations with their own stations and are unlikely to make room for Radio E. While DAB transmissions are possible from Astra and Eutelsat, a proper service that could seamlessly fit in with terrestrial DAB and portable receivers will have to wait for low-orbit digital satellites.

Following the time-honored "Not Invented Here" philosophy the National Association of Broadcasters has rejected DAB in the U.S. in favor of an alternative system combining FM and digital signals. Meanwhile, the FCC has granted licenses to Satellite CD Radio and American Mobile Radio Corp for digital satellite radio services to the US. This DARS (Digital Audio Radio Service) will use spectrum above 2310 MHz for broadcasts from low orbit satellites. So Europe and America will be fighting out the NTSC/PAL wars once again, over digital radio, with receivers of limited geographic functionality.

One new digital international radio project is definitely moving forward. WorldSpace was founded by Noah Samara in 1990, and has its headquarters in Washington, DC. The plan is to launch three geostationary satellites which will provide programming specifically to Third World countries: AfriStar to Africa and the Middle East, AsiaStar to Asia, and AmeriStar to Latin America and the Caribbean. Each will provide 100 digital audio channels to the entire coverage area.

The first satellite to be launched will be AfriStar in June 1998 on Ariane. It will be followed at six month intervals by AsiaStar and AmeriStar. All three are being made by Alcatel Espace of France. Broadcasters who have signed up so far include some familiar names to the shortwave and tropical band DX community, such as the Voice of America, Radio Netherlands, Colombia's Radio Cadena Nacional, the Ghana Broadcasting Corporation, and Kenya Radio and TV, along with Korea's New World Sky Media, and Nigeria's Ray Power 100 FM.

The plan depends on the development of affordable receivers. By using economies of scale, the goal is produce new satellite receivers costing between \$20 and \$30. These would be truly portable, with antennas the size of credit cards.

WorldSpace and similar projects may be a threat to traditional tropical band DXing. Some of those exotic stations may disappear from

the shortwave bands if local listeners can tune into one hundred stations on cheap portable receivers. On the other hand, some of the exotic stations may become accessible for listeners over an entire continent, or even a hemisphere. (Some interesting DX prospects here?)

■ From Satellites to Cyberspace

The digital age could open up the planet for thousands more radio stations over the Internet. When Radio Sweden (and *Sweden Calling DXers*) changed focus from shortwave to satellites, *SCDX* founder Arne Skoog was very skeptical. Arne was sure satellites would never replace shortwave, and pointed to the cost and size of receiving equipment, and the lack of portability as the main reason.

I always thought Arne was forgetting the history he had been a part of. In Britain the simplest Astra dishes and receiver packages sell for under £100 (around \$150 dollars). That's cheaper than almost any decent shortwave receiver. Even in Scandinavia, where a satellite package may cost 5000 kronor (around \$800), that's still less than a quality professional DX machine.

Satellite receivers admittedly aren't very portable. But until very recently shortwave receivers weren't portable either; they were boxes at least as large as a modern satellite receiver, and just as firmly connected to antennas as the connection to the satellite dish. But this is about to change. The upcoming generations of DAB and WorldSpace receivers will be just as portable as any current pocket Sony shortwave model.

But then there's the Internet. Soundfiles have been available over the World Wide Web since its inception, but the drawback was the long time required to access the file—perhaps ten minutes of download for every minute of audio. That changed in April 1994, when Seattle's Progressive Networks introduced RealAudio, which allows an audio file to be played while it downloads, more or less instantly. Since then RealAudio has progressed to versions 2.0 and 3.0, and the Real (Video) player and competing systems like Streamworks have appeared, providing both audio-on-demand and live broadcasts. Right now there are hundreds of radio stations around the world you can listen to on the Internet, including many international broadcasters and the entire World Radio Network output. See p. 56 for our exclusive WRN I schedule on Internet compiled by Jim Frimmel.0

For a small station like Radio Sweden this is wonderful. Swedes and interested non-Swedes anywhere in the world can access programs whenever they want, from where

ever they are. The quality initially sounded worse than AM radio, and RealAudio 3.0 doesn't always live up to its claim of sounding like FM. But what does that matter to an international broadcaster? It's still better than shortwave, and high-speed permanent Internet access and a RealAudio server cost a lot less than a 500 kilowatt transmitter.

Juhani Niinistö of Radio Finland says the Internet has some definite advantages over satellite distribution: "In parts of Africa the Internet is very popular due to the large size of the dish required for our Intelsat relay there, and due to the short length of our shortwave transmissions."

Oddly, while Arne Skoog is critical of satellite radio, he approves of radio on the Internet. This may have something to do with his granddaughter in Australia being able to listen to Swedish Radio on her desktop computer. But that's as good as reason as any.

So far, though, the portability is missing. I wrote an article about Internet Radio for the 1995 *World Radio TV Handbook* in which I fantasized cutting off the modem connection to the computer and somehow transmitting all the Internet bandwidth into the air. It was

a vision that betrayed a less than perfect understanding of the way the Internet works.

Where an analog cable TV network has to provide bandwidth for all of its TV and radio channels, an interactive digital network essentially only has to provide one signal at any given moment. You can have access to thousands of radio stations out there on the Net, but generally you only ask for one at a time, and then receive just one at a time over your existing bandwidth.

Right now you can take a laptop computer and access the Internet over a digital GSM telephone in most of Europe, as well as parts of Africa, the Middle East, and Asia. So you can tune into a RealAudio radio station. The only problem is that, currently, GSM works at 9600 bps and RealAudio really requires 28.8 kbps or better, and the signal tends to break up a lot at slower speeds. GSM calls are also very expensive, so mobile listening to radio on the Internet can be pretty costly.

GSM manufacturers are working to improve the speed for digital access, and perhaps the cost of the calls will come down, but there are other solutions as well. In some American cities there is wireless Internet

service from Richochet and other companies, at speeds and costs about the same as ordinary Internet Service Providers. With such a connection you can listen to Web radio on a laptop anywhere in the coverage area. (Finally a use for Newtons and other PDAs?)

Better still, after the turn of the century the planned Internet access from low orbit satellite networks like Iridium and Teledesic will make Internet Radio as portable as modern FM. This is where things can get a bit mixed up, as DAB, terrestrial or satellite, also carries images and text information using the standard HTML code used on the World Wide Web.

Is listening to a Teledesic relay of a RealAudio streaming audio program or accessing a DAB-station's Web page via Iridium *satellite radio* or *cyberspace radio*? Or will there be a difference?

Hopefully even in that networked future there will still be a few tropical radio stations for the DXers to chase. But (assuming the politicians and bureaucrats can work out the royalties for global netcasts) the rest of us will be able to listen to virtually any radio station in the world, from anywhere in the world.

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ANT 2	Grove Skywire Antenna	\$39.95
ANT 7	Scantenna	\$39.95
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MAN 1	Service Manual	\$57.95

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The Name's the Thing

Three standards have emerged as the front runners in a continuing technological battle of wireless air interfaces. An alphabet soup of acronyms are being used to differentiate new services as proponents and foes of each standard form alliances to market their choice to the consumer.

Code Division Multiple Access (CDMA), Global System for Mobiles (GSM), and North American Digital Cellular (NADC) are all competing in the marketplace for acceptance in upgraded cellular and new PCS networks. No longer content to advertise pricing and features, major service providers are now using brand names to build consumer confidence and loyalty.

■ Code Division Multiple Access (IS-95)

Code Division Multiple Access is a method by which a number of callers share the same frequency at the same time but are kept separate by the use of pseudo-noise (PN), or spreading, codes. Using these codes, a receiver can "de-spread" the desired signal and recover a particular caller's data (see the February 1997 *PCS Front Line* column for an introduction to CDMA).

The current CDMA specification, termed IS-95, was originally developed by San Diego-based Qualcomm, Inc., and became an approved Telecommunications Industry Association (TIA) standard in July of 1993. Early CDMA systems were established in Hong Kong and Korea, but are now rapidly being built in the United States. Many existing cellular carriers are converting portions of their 800 MHz spectrum from analog to digital CDMA service, and according to the CDMA Development Group (CDG), an industry association of

IS-95 proponents, of the nearly 3,000 PCS licenses granted by the FCC, slightly more than half of the license holders have chosen CDMA, while GSM was selected by 28 percent and TDMA by 20 percent.

The CDG is also attempting to "brand" IS-95 networks under a single term — cdmaOne. This trademark is supposed to serve as a catch-all term for the family of wireless products using the IS-95 air interface, including cellular, PCS, and wireless local loop.

Major CDMA vendors Lucent Technologies, Motorola, Nortel, and Qualcomm are also working with CDG to develop specifications for a next-generation "wider-band" IS-95-based CDMA technology.

It should be noted that not all proposed CDMA networks follow the IS-95 standard. Ericsson and Nokia, two major European suppliers, are testing a "wideband CDMA" (W-CDMA) not related to IS-95. Optimized for such high speed data applications as Internet access, multimedia electronic mail, high quality voice, and even video, W-CDMA uses a CDMA air interface linked to a GSM network infrastructure.

In Japan, Nippon Telephone and Telegraph's DoCoMo is performing experimental field tests on both Ericsson's W-CDMA and an IS-95 follow-on developed by Lucent Technologies.

■ Global System for Mobiles

The Global System for Mobiles (GSM) is an international air interface and network standard that has been developed and refined over the past decade, primarily in Europe. Several North American GSM service providers have recently formed the GSM Alliance to jointly market digital wireless voice and data services on PCS frequencies (1,900 MHz) and will be working to provide uniform features, roaming rates, and other services across the country.

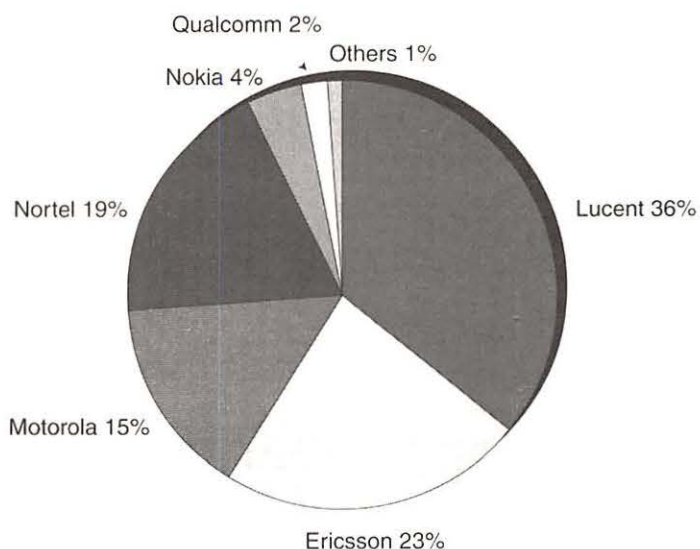
The GSM Alliance includes Aerial Communications, BellSouth Mobility DCS, Microcell Telecommunications, Inc. (Canada), Omnipoint Communications, Pacific Bell Mobile Services, Pocket Communications, Powertel, and Western Wireless. Microprocessor giant Intel is also supporting the alliance through its Mobile Data Initiative in an attempt to boost growth in the wireless data market.

The first commercial PCS network in the United States, American Personal Communications' Sprint Spectrum, uses the GSM standard and will be involved in the Alliance, but is also affiliated with Sprint, which has selected CDMA.

The use of GSM in North America has been limited to PCS frequencies in part because of its 200 kHz wide channels, which cannot be easily retrofitted into the 800 MHz cellular band allocation of 30 kHz wide channels.

GSM has also introduced the Subscriber Identity Module, or SIM, to U.S. consumers, containing security, identity, and other information. These programmable smart cards can be easily transferred from one wireless handset to another, allowing a subscriber to quickly change equipment while retaining the same access number and service features.

PCS Infrastructure Market Share



■ North American Digital Cellular

North American Digital Cellular (NADC) is based on IS-136, an enhancement of an older standard that makes use of Time Division Multiple Access (TDMA) techniques. NADC was originally slated to be the single digital standard for the United States prior to Qualcomm's IS-95 proposal, and has been in use for several years.

The largest proponent of NADC, AT&T Wireless, is using TDMA in both new PCS frequencies and upgraded analog cellular areas, creating some additional confusion by marketing their 800 MHz NADC service as "Digital PCS." Purists would claim PCS refers to services in the 1,900 MHz band, but AT&T counters that consumers are interested in features and capabilities, not operating frequencies.

■ Customer Acceptance

All three standards promise increased user capacity, improved sound quality, fewer dropped calls, and broader coverage area than the analog equivalent. The digital nature of the air interface also allows additional services, such as caller ID and paging, to be easily incorporated into the system.

At the end of June there were an estimated 646,000 GSM customers and 420,000 CDMA customers. In the near term, GSM operators appear to be growing quickly. For example, BellSouth Mobility DCS and Pacific Bell Mobile Services both claim more than 100,000 customers, while in seven and a half months Omnipoint has signed up 42,000 customers.

PCS LICENSE HOLDER SERVICE AREA STANDARD

AT&T Wireless Services, Inc.

AL, AR, AZ, CA, CO, CT, DC, DE, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MI, MN, MO, MS, NC, NE, NV, NY, OH, OK, PA, PR, SD, TN, TX, UT, VA, VT, WA, WI, WV, WYTDMA

NextWave Personal Communications Inc.

CA, CT, DC, DE, FL, GA, IL, IN, KY, MA, MD, ME, MI, MO, NH, NJ, NM, NV, NY, NC, OH, OK, PA, RI, SC, TX, UT, VA, WICDMA

Omnipoint Corp.

AL, AR, CO, DC, FL, GA, IA, IL, IN, KS, MA, MD, ME, MI, MO, NC, NH, NY, OH, OR, PA, PR, RI, TN, TX, VA, WV

GSM Pacific Bell Mobile Services

CAGSM

Pocket Communications

AR, HI, IL, IN, KS, LA, MI, MO, NE, NV, OH, TXGSM

PrimeCo Personal Communications

LPAL, FL, HI, IL, LA, TX, VA, WICDMA

Sprint PCS

AK, AL, AR, AZ, CA, CO, FL, GA, HI, IA, ID, IL, IN, KS, KY, LA, MA, MI, MN, MO, MS, NC, NE, NM, NY, OH, OK, OR, PA, PR, SC, TN, TX, UT, VA, WA, WI, WV, VICDMA

Western Wireless Corp

AR, AZ, CA, CO, HI, IA, ID, IL, KS, MN, MO, MT, ND, NE, NM, OH, OK, OR, PA, SD, TX, UT, VA, WA, WIGSM

■ Wireless Infrastructure

Like the gold rush of the mid-1800's, the ones making the money are the equipment providers. PCS and cellular infrastructure revenue in 1996 reached \$5.3 billion, up from \$3 billion in 1995. PCS equipment alone went from \$530 million to \$2.8 billion during that period. Lucent Technologies led the pack with more than a third of the market, followed by Ericsson and Motorola. Nortel had nearly 20 percent of the market and was the only provider to win both CDMA and GSM contracts of significant size.

■ Cellular and GPS

The Global Positioning System (GPS), operated by the United States Department of Defense, is a constellation of 24 low earth orbit satellites which provide accurate position and time information to military and civilian users. GPS first gained fame during Operation Desert Storm by providing pinpoint accuracy for soldiers and guided munitions. Peacetime uses for accurate location information are now quite numerous, and even more will be found as GPS is combined with wireless communication networks.

Automobile manufacturers are incorporating GPS and cellular technology to provide security, safety, and peace of mind to their customers. The OnStar division of General Motors currently provides cellular communications units and service to more than 12,000 customers, and hopes to install as many as two million OnStar units in more than twenty of GM's 1998 models. At \$270 a year for unlimited service and \$900 for installation, the service is not cheap, but provides 24 hour monitoring and the ability to remotely lock and unlock doors as well as perform engine diagnostics. Lincoln offers their version, termed remote emergency satellite cellular unit (RESCU), in Continentals at a retail price of \$1995.

Consumer studies have shown that the primary reason for purchasing a cellular phone is safety, and adding accurate GPS location information to a distress call has clear value. Further advancements in these technologies include sending a cellular message if the air bag is deployed or a major mechanical malfunction occurs.

Smaller devices are also currently in development to provide personal security in a handheld package. When the user presses a panic button the internal GPS receiver sends current position information via a tiny cellular digital packet data (CDPD) modem to an operations center, which can then dispatch emergency services or assistance to the proper location.

That's all for this month. Keep that electronic mail coming to dan@decode.com, or check the PCS Front Line website at <http://www.grove.net/~dan>. Until next month, happy monitoring!



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Acts of Congress – Part II

Last month this editor heaped a good deal of criticism upon Congressman Ed Markey and his infamous bill HR 1964. I wrapped up that piece with the comment that Congressman Markey was an obviously intelligent man but perhaps had misunderstood the ramifications of the scanner-related section of his Act.

By August 13th I had become so concerned about the pending legislation, both Markey's and Billy Tauzin's, that I decided to make some calls and hopefully attain a better understanding of the situation. What suddenly hit me was the fact that my company is based in Congressman Markey's 7th district. So I decided to call my Congressman's office.

I had a long discussion with Colin Crowell, Congressman Markey's staff aide on telecommunications. Mr. Crowell spent nearly one hour on the phone with me and was most respectful and patient. He clarified a great many alleged misconceptions about the intent of the bill. Here's the gist of our conversation as I interpreted it. (An e-mail copy of these points was sent Mr. Crowell for his comments. Should he wish to make any corrections later, I will include them next month.):

1. Congressman Markey's bill is not likely to go anywhere. At present, it has no co-sponsors and is not under consideration for hearings.
2. The intent of the bill (HR 1964) is to extend the same privacy rights to CMRS (commercial mobile radio service) users, who may utilize telephone interconnect services, as the cellular users are afforded in the ECPA and its follow-on legislation (i.e. prohibition on monitoring cellular calls, and no scanners are to be manufactured with the cellular frequencies).
3. The FCC has "forbearance" in these situations and may provide exclusions from any frequency prohibitions. (I'm not totally clear on this provision, which needs further clarification.)
4. The Congressmen (Tauzin and Markey) are not interested in marching scanner or shortwave radio users lock-step off to prison or in putting scanner manufacturers out of business.
5. Mr. Crowell said that if an agency feels a great desire to have their communications monitored, it should have that right. (This statement does concern me. Perhaps I don't understand the exact meaning.)
6. I informed Mr. Crowell that scanners are used by volunteer firefighters, law enforcement (including every State Police cruiser in Massachusetts), emergency management and others. Mr. Crowell appreciated my argument that if only public servants were allowed to use scanners, and Uniden and Radio Shack lost the opportunity to sell to the general public, scanners would either no longer be produced or their cost would rise exponentially. Public safety would either lose the ability to purchase scanners or their cost to the taxpayer would be enormous.
7. The Congressman recognizes that there are thousands of NASCAR fans, for example, for whom this legislation could be crippling to their enjoyment of their \$200 or \$300 scanner investment. (This



Markey's staff insists it is not their intent to shut down the scanner industry.

is but an example. There are shortwave listeners, marine radio two-way users, the elderly and disabled who use scanners as a perfect hobby for the house bound, as well as general radio hobbyists who utilize their scanners in constructive and enjoyable ways—all of whom are in danger of losing their hobby if the bills pass as written.)

8. Most importantly, as Mr. Crowell states, these bills have been proposed to encourage discussions and hearings, so that the concerns of the public safety community, the hobbyist community, and others may be heard, and the language of the bill subsequently adjusted.
9. The crux of the issue may be that the FCC needs to reform so that public interconnect frequencies are not shared with public safety. These hearings may accelerate that process.
10. TV Channels 60-69 may be made available to public safety agencies shortly. As agencies migrate to this band, perhaps scanners would be permitted to include this range of dedicated police, fire, EMS, and local government frequencies as there would not then be a concern of public interconnect issues.

Mr. Crowell listened to all my arguments carefully and engaged in a useful debate over many of the points I outlined in last month's article.

While I told Mr. Crowell that I respect the desire to honorably consider and debate the benefits of offering privacy to public interconnect users, I could not understand how Congressman Markey would co-sponsor Mr. Tauzin's HR 2369. It's one thing to present a bill which has some problems, but which can be marked-up and amended during a hearing. It is quite another thing to propose or co-sponsor so draconian a measure as HR 2369. This bill takes 63 years of workable, sensible legislation (the Communications Act of 1934) and turns it inside out.

I want to reiterate, though, that after talking with Mr. Crowell and others in Congressman Markey's office, I was left most impressed. I was impressed with the eagerness which was shown in trying to understand and reconcile my position with the Congressman's. After this phone call I can only believe that Mr. Markey will do the right thing and enforce existing law, perhaps double the penalties for criminals making inappropriate use of a scanner, require that CMRS telephone interconnect providers offer more encryption options to

their customers, and the like. There are actions that can be taken which would offer complete security (rather than the illusion of security) to any two-way radio user who desires it, but at the same time maintain the rights of hobbyists as well as public servants to monitor the airwaves as they have done since the dawn of radio.

I applaud Congressman Markey's staff. I look forward to the day when I can applaud the Congressman himself for recognizing the faults in Billy Tauzin's broad-brush bill and taking action to set it straight.

■ Seattle Area Trunking

One of the most complex, but also one of the most interesting, trunked systems in the country is located in the Seattle/King County area of Washington state. According to FCC records, there are numerous trunked systems in the Seattle area, many of which operate off of more than one site (probably due to the hilly terrain which requires fill-in, zonal-type transmitters).

From 3000 miles away, we had heard stories that the agencies in the Seattle area which owned the trunking systems had been swapping around frequencies, trying to find the right combination for their respective areas. Uniden TrunkTracker BC-235 customers had been reporting on TRUNKCOM, and through www.trunktracker.com e-mail contacts, that they were having difficulty figuring out which frequencies matched up with the appropriate data channels. With so many transmitter sites in the region, it was unclear what data channels fed which frequencies.

Your scanner editor just made a trip to Seattle to try to wade through the confusion and make sense of the area's systems. Using the new TrunkTrac™ software, as well as the BC-235, I was able to determine frequency plans and obtain a fairly good understanding of what's happening in the Sea-Tac (Seattle/Tacoma) region. I must also thank Rick Thompson, Dan Lawrence, and their friend Rich, as well as Steve Gardner, for their time and the fine work they're doing on understanding their local trunking networks.

What I learned is that the Seattle area system must be one of the most unique, and innovative, trunked networks in the nation. What has apparently happened in the Sea-Tac area is that numerous public safety agencies have pooled their resources to create, in effect, a single massive system, a Regional Emergency Communications System, making communications and inter-operability between agencies easy and efficient.

The Seattle region is growing rapidly. With Boeing, Microsoft, Starbucks, and other large companies populating the area, and thousands streaming out of California for the less hectic grind of the Northwest, Seattle is a popular place to be. And the eastern Puget Sound region is huge. From Bellevue and Redmond in the north and east, west to Seattle itself, and south to Renton, Kent, Sea-Tac (where the airport is located), and Auburn, there are thousands of square miles in this King County territory.

Originally, a number of individual trunked systems were destined to go online: Eastside Public Safety (EPSCA), King County (the King County sheriff, fire department and various county agencies), Valley Communications (Valley Comm), to cover incorporated communities within the county, the city of Seattle, and the Port of Seattle. While we are making some educated guesses about how these systems came to be, what we now believe to be the case is that there is one large regional Motorola Type II trunking system, which is actually split up into multiple zones somewhat in accordance with the original design. From what we understand, King County and Valley Comm have

merged, although they have separate dispatchers, and EPSCA and the city of Seattle, both maintain their own autonomy within the system (the Port of Seattle has its own separate system). However, units can apparently roam from one end of the county to another, and from one "zone" to another, without changing ID's.

This is what made it so difficult to previously understand how frequencies matched up with data channels. A Seattle police unit using talkgroup ID 3312 was heard on multiple frequencies and what appeared to be multiple systems. Actually, these group broadcasts, like so many others, are simulcast throughout many, if not all, zones within the larger system. (It may depend on whether there are units of group 3312, for example, within range of one of these zones as to whether its talkgroup is made available, and is simulcast, off that zone's frequencies.) Generally speaking, you could monitor the Seattle police department by trunk monitoring the city of Seattle, EPSCA or King County/Valley Comm's set of frequencies.

What makes this all so interesting is that you only need to figure one set of ID's for the entire system. A King County unit will not have the same ID as a city of Seattle unit, even though that K.C. unit may never roam into the Seattle zone. By monitoring only the EPSCA system, you'll likely hear city of Seattle police and fire department units, King County sheriff and fire communications, as well as the primary departments dispatched by EPSCA, such as Redmond, Bellevue and others in the northern county area.

Note: Again, this editor is making some assumptions based on monitoring. If you feel that portions of this article are incorrect, please write or send e-mail with your questions and comments. We are very interested in trying to determine exactly which agencies are dispatched out of EPSCA, King County, and Valley Comm. Also, it is our understanding that things are still in a state of flux as far as frequencies are concerned. You will note below that not all licensed frequencies appeared in use. We've been told that more frequencies will come online within the next 90 days. Finally, the city of Tacoma, some 20 miles to the south of Seattle, has its own trunking system licensed. We're not sure if it's tied in with the regional communications system or if it's even on the air.

What is perhaps most interesting of all regarding monitoring Seattle trunking is how open-minded the city is about it. Prior to the introduction of the BC-235 TrunkTracker, you could write the city and request to purchase a Motorola radio programmed with certain police and fire talkgroups. The city recognized that the public has a right to monitor and that the public can provide a valuable service by keeping informed. What is really most terrific about this enlightened city, is that you can now obtain selected "Bearcat" talkgroup ID numbers directly from the city's Executive Services Department! That's right, the city is even converting their radios' Hex code into decimal for BC-235 TrunkTracker users! I raise my cup of Java (yes, you can find a coffeehouse anywhere in Seattle) to this great city, and its great people, in the northwest.

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REGIONAL EMERGENCY COMMUNICATIONS SYSTEM

TALKGROUP ID'S

(Seattle, King County/Valley Comm, EPSCA, and possibly even Port of Seattle. Special thanks to Rick Thompson, Dan Lawrence, and their friend Rich, as well as Steve Gardner, and the participants in the Washington "Interceptor" web site for their assistance.)

Regional Emergency Communications System

ID	Agency	ID	Agency
48	Police at SeaTac Airport	6864	Seattle Event 4 (Citywide Event)
80	Harbor Patrol Police	9072	Health Department EOC
1648	Seattle Fire Department -1-	9232	Water Front PD?
1680	Seattle Fire Department -2-	18416	Redmond Police - Tactical/Car to car
1712	Seattle Fire Department -3-		
1744	Seattle Fire Department -4- Dispatch	18544	Redmond Police
1776	Seattle Fire Department -5- EMS	18928	Mercer Island Police
1808	Seattle Fire Department -6- EMS	19472	Kirkland Police
1840	Seattle Fire Department -7- Tactical	21232	Bellevue Police - Car to car
1872	Seattle Fire Department -8- Tactical	21360	Bellevue Police - Records
1904	Seattle Fire Department -9- Tactical	21424	Bellevue Police - Primary Dispatch
1936	Seattle Fire Department -10- Tactical	22192	Eastside Fire - Tac 2
1968	Seattle Fire Department -11- Ambulance	22224	Eastside Fire - Tac 1
2000	Seattle Fire Department -12A- MEDCOPM	22384	Eastside Fire Dispatch (Bellevue & surrounding area)
2096	Seattle Fire Department - Administration	22416	Radio Maintenance?
3248	Seattle Police Department -West- Dispatch	23152	King County Police Department - North (460.325 Simulcast)
3280	Seattle Police Department -North- Dispatch	23216	King County Police Department - Southeast (460.450 simulcast)
3312	Seattle Police Department -South- Dispatch	23248	King County Police Department - Tac 3
3344	Seattle Police Department -East- Dispatch	23280	King County Police Department - Southwest (460.400 simulcast)
3408	Seattle Police Department -Data-	23472	King County Police Department - Data (460.275 simulcast)
3440	Seattle Police Department -Tac 1-	23504	King County Police Department - Tac 1 (460.500 simulcast)
3472	Seattle Police Department -Tac 2-	23536	King County Police Department - Countywide
3504	Seattle Police Department -Tac 3-?		
3536	Seattle Police Department -Tac 4-?	26672	Redmond Police
3632	Seattle Fire Department -East Tac-	29136	Federal Way Police
3664	Seattle Fire Department -South Tac-	29168	Federal Way Police - Data
3696	Seattle Fire Department -North Tac-	31408	Eastside Fire
3728	Seattle Fire Department -West Tac-	36947	Auburn Police (check)
3952	Harbor Patrol	37171	Kent Police (check)
3984	Seattle Police Department	37264	Renton Police - Tactical
4048	Seattle Police Department	37296	Renton Police - Administration
4240	Seattle Police Department	37328	Tukwila Radio
4912	Key Arena	37360	Tukwila Radio - Tac
4944	Key Arena	37392	Tukwila Radio - Administration
5168	Seattle Center	38448	King County Fire 1
5520	Seattle - Woodland Park Zoo	38480	King County Fire 2
5552	King County Animal Control	38512	King County Fire 3
6480	Seattle Water & Sewer	62896	MARS (King County Command)
6768	Seattle Event 1 (Citywide Event)	63184	Radio Shop
6800	Seattle Event 2 (Citywide Event)		
6832	Seattle Event 3 (Citywide Event)		

FREQUENCIES BY SYSTEM ZONES

(Frequencies marked with a * are licensed to the system but were not active during our test using TrunkTrac software. They may either be scheduled for future use or simply these repeaters may have been down for repair.)

City of Seattle (Columbia Tower Site) - Primary Sites

851.1875*	854.3625	866.8875*
851.4125*	866.2875	867.2875
851.9375	866.3125*	867.7625*
851.9875	866.3375	867.7875
852.1625*	866.4375*	868.1750 Data
852.6875	866.6875	868.4750
852.9125	866.7125	868.6750*
853.4375	866.7375*	868.8750
854.1875		

Seattle Fill-in Coverage Sites (not monitored or known if on-the-air)

City of Seattle - Apple Cove Site	City of Seattle - North Metro Site
866.1625	859.2375
866.4125	860.2375
866.6625	859.4875
	860.4875

City of Seattle - South Metro Site

855.4625	855.9625
855.7125	856.9875

(Note: As long as you can receive the primary system there is no need to monitor the fill-in sites as all communications broadcast on the fill-ins are likely simulcast off of Columbia Tower.)

Eastside Public Safety Communications Authority (EPSCA)

851.1375*	854.2375	866.9125	867.4875	868.5250*
851.8875	866.2125*	866.8875*	867.8125	868.7750 Data
852.6375	866.2375	866.9875	867.8875*	868.8250*
853.3875	866.4625	867.3125	868.2000*	

Eastside Public Safety North Seattle Fill-in Site

867.2250	867.3625	868.9500
867.2500	867.3875	868.9750

Eastside Public Safety Mobile Data Terminals (used systemwide?)

852.7125

King County/Valley Communications

Primary Site (?) Not monitored

851.0625	851.9625	853.4875	866.3875	867.8375
851.0875	852.1125	853.6125	866.9375	867.8625
851.1625	852.6125	854.0875	866.9625	868.4250
851.3625	852.8625	854.2875	867.3375	868.4500
851.8125	853.3125	866.3625	867.4375	868.7000
				868.7250

King County/Valley Comm - McDonald Pt. Site (confirmed)

856.4375*	857.4375	858.7125*	859.7125*	860.7125*
856.7125	857.7125	858.9375	859.9375	860.9375 Data
856.9375	857.9375	859.2625*	860.2625*	
857.2625	858.2625	859.4375	860.4375*	

King County/Valley Comm - Sobleski Site (unconfirmed)

855.9875
858.9625
859.4625
859.9625
860.4625
860.9625

King County/Valley Comm - Dodge Ridge Site (unconfirmed)

855.2375
856.4625
856.9625
857.4625
857.9625
858.4625
859.7625

King County/Valley Comm - Grass Mtn. Site (confirmed)

856.2375*
856.4875
857.2375
857.4875*
858.2375*
858.4875 Data

(Note: Only a couple of ID's were monitored using this fill-in site. They were, perhaps, small town units on the outskirts of the county.)

Port of Seattle

(confirmed - unknown if its units roam throughout the larger system)

851.1625
851.2625
851.3125
852.0125
852.8125
853.5125
853.5625 Data
854.2625 Data
854.3125 Data

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Military Frequency Bonanza

This month we are going to take a look at some of the frequencies that have been forwarded to this column by our readers. We have quite a bit of ground to cover, so let's get started.

First we present an extensive list of European military HF communications forwarded by Mr. TF in the UK. The mode used on all these frequencies is upper sideband (USB) unless otherwise indicated.

Denmark

Primrose-Royal Danish Air Force, Vaerloose
4577 (?), 6720, and 11246 kHz

France

Marguerite-French Air Force Circus Net (ARCN)
6712 (Marjolaine 2), 8972 (Racontar 1), 8993 (Vinaigrette 3), 9006, 11510, 13236 (Raphael), 18010 (Citadelle 1), 23254 kHz (Verite 3)

Other French Air Force Stations to watch for include:

Circus Blanc	Bangui, Central African Republic
Circus Bleu	La Reunion, Reunion Island
Circus Citron	Cayenne, Guyana
Circus Dore	Djibouti, Djibouti
Circus Fauve	Fort de France, Martinique
Circus Lilas	Libreville, Gabon
Circus Orange	Dakar, Senegal
Circus Tango	Paris/Villacoublay, France
Circus Tilleul	N'djamena, Chad
Circus Vert	Paris/Villacoublay, France

FUI-French Air Force, Unknown location
3032 (ARCN 171), 3044 (C3 common), 3909 (ARCN 172), 5714, 6718, 6760, and 6996 kHz

FWI-French Air Force, Unknown location
5702 and 6757 kHz

Germany

DHM91-German Air Force Munster Air, Germany
(DHO 26 has also been heard on these frequencies)
3107 (Alpha), 3143 (Bravo), 4721 (Delta), 5687 (Echo), 8965 (Kilo), and 11217 kHz (Mike)

DHJ59-German Navy Wilhelmshaven, Germany
2625 (Maritime Rear Link 59/02), 4154 (MRL 59/04), 6779.0 (MRL 59/06), 8335 (MRL 59/08), 10163.5 (MRL 59/10), and 12415.5 kHz (MRL 59/12?)

Note: DHJ59, JWT-Stavanger Naval Radio (Norway), the Italian naval radio station IDR-Italian Naval Rome (Italy), and their associated stations operate two nets on HF. One net is for warships and the other is for maritime patrol aircraft. The maritime patrol net is known as the airborne communications net (ARCN).

DHJ?-German Naval Radio, unknown location
5018 kHz

DHJ52/67-German Naval Radio, unknown location
5722 kHz

DHJ61-German Naval Radio, unknown location
4604 and 5016 kHz

DHJ69-German Naval Radio, unknown location
4811 kHz

DHJ64-German Naval Radio, unknown location
4496.5, 4744 (shared frequency with JWT), and 4836 kHz

DHJ78-German Navy Flensburg, Germany (call word Argonaut)
5691, 6730, 6733, 6747, 6750 (78/01), 6752, and 9035 kHz

Ireland

Irish Air Corps: 5254 and 5708 kHz

Italy

Italian Air Force (ARCN)
3143 (ARCN 321), 4721 (ARCN 322), 5714 (ARCN 323), and 6733 kHz (ARCN 324)

IBA-US Navy Napoli, Italy
9207.5 kHz

ICA-Italian Naval Radio Ancona, Italy
2350.5

ICH-Italian Naval Radio La Maddalena, Italy
2329.5 and 6746 kHz

ICM-Italian Naval Radio Unknown location
4711 kHz

ICN-Italian Naval Radio Napoli, Italy
4116.0

ICS-Italian Naval Radio La Spezia, Italy
4439 and 6873.5 kHz

ICT-Italian Naval Radio Taranto, Italy
4154.5 and 6708 kHz

IDJ-Italian Naval Radio Unknown location
6708 kHz

IDR-Italian Naval Radio, Rome (ARCN)

3182, 4721, 4723, 4839, 6708, 6733, 6746, and 6755 kHz

IGJ-Italian Naval Radio Augusta, Italy
4168.5 and 6708 kHz

I??-Italian Naval Radio, Unknown location
5405.0 (shore station heard calling 1041)

Norway

JWT-Stavanger Naval Radio, Norway.
2413, 2687, and 2744 kHz

Portugal

CTP-NATO Naval Radio, Lisbon, Portugal

4742 (CTP with RTTY over RAF Architect a couple of times), 6730 (voice and RTTY), and 6699 kHz (not used very often, but I have heard USN and European voice call up and RTTY)

Airborne Radio Communications Nets (ARCN)

Ary Boender referred to ARCN 131 for JWT in the August 94 Ute World logs under the 6727 kHz entry. ARCN 131 would normally refer to a three megahertz frequency.

6727	ARCN 405	Common European ARCN frequency
6697	ARCN 113	MKL-RAF Edinburgh, UK
9036	ARCN 115	MKL-RAF Edinburgh, UK

There are several ARCN channels set aside for common use such as 420(?) ARCN 401 which includes stations like MKL; PBV-Dutch Air Force Vaikenburg, Netherlands; DHJ59, and IDR.

A huge *Utility World* thanks goes out to Mr. TF for his fine list of HF European military voice frequencies.

MARS in Europe

No, I'm not talking about the Mars Pathfinder mission in this portion of the column: I'm talking about the U.S. Army MARS frequencies currently being used in Europe. Many *UW* thanks to Sidney for sending us the comprehensive list of Army MARS frequencies in Table 1.

USAF Tanker Callsigns

From time to time we get a few requests for U.S. Air Force callsigns for the various KC-135 tanker units commonly heard on the global HF system (GHFS) frequencies. Table 2 a list courtesy of T. Okamura in Japan and his excellent Iron Birds website at URL: <http://www.asahi-net.or.jp/~uq6t-okmr/callsign/csdke.html>

TABLE 1: U.S. Army MARS frequencies in Europe

Desig ²	Authorized Frequency (kHz)	USB (D)	LSB (C)	Areas Authorized	Remarks
A1	3855.0	3883.5	3886.5 ¹	Germany-Germany	Primary Data Network
B1	3897.5	3896.0	3899.0	Germany-Germany	
C1	4015.0	4013.5	4016.5	Germany-Germany	
D1	6997.5	6996.0 ¹	6999.0	Europe-Europe	
E1	4870.0	4868.5	4871.5	Germany-Germany	Local Voice Contacts
F1	5432.0	5430.5	5433.5	Germany-Germany	
G1	141.775 MHz ¹	FM		Germany-Germany	
H1	6910.0	6908.5	6911.5	Germany-Germany	
I1	6940.0	6938.5	6941.5	Germany-Germany	
J1	4590.0	4588.5	4591.5	Germany-Germany	
A2	3871.0	3869.5	3872.5	Germany-Bosnia	
B2	5737.0	5735.5	5738.5	Germany-Bosnia	
C2	6882.5	6881.0	6884.0 ¹	Germany-Bosnia	
D2	7574.5	7573.0	7576.0	Germany-Bosnia	
	5401.0	5399.5	5402.5	Germany-USA	
	6825.0	6823.5	6826.5	Germany-USA	
	7475.0	7473.5	7476.5	Germany-USA	
	9810.0	9808.5	9811.5	Germany-USA	
	10327.0	10325.5	10328.5	Germany-USA	
	11070.0	11068.5	11071.5	Germany-USA	
	11455.0	11453.5	11456.5	Germany-USA	Primary Phone Patch Net
	12072.0	12070.5	12073.5	Germany-USA	
	14403.5	14402.0 ¹	14405.0	Germany-USA	
	14405.0	14403.5	14406.5	Germany-USA	
	14406.5	14405.0	14408.0	Germany-USA	
	14665.0	14663.5	14666.5	Germany-USA	
	15551.0	15549.5	15552.0	Germany-USA	
	16041.0	16039.5	16042.0	Germany-USA	
	19024.0	19022.5	19025.5	Germany-USA	
	19532.5	19531.0	19532.5	Germany-USA	
	20975.0	20973.5	20976.5	Germany-USA	
	20992.5	20991.0	20994.0	Germany-USA	
	20994.0	20992.5	20995.5	Germany-USA	
	20995.5	20994.0	20997.0	Germany-USA	
	27994.0		AM	Germany-Germany	

Notes:

¹ This call frequency is also monitored outside of scheduled net times

² Designators for the frequencies above are made by combining the basic designator shown for each frequency with the modifier for mode. For example, A1C=3886.5 kHz (LSB)

TABLE 2: U.S. Air Force callsigns for the various KC-135 tanker units

Units		Aircraft	Unit Callsign	Reach Mission Callsign
ACC	366 Wing	22 ARS	KC-135R	Guntfighter
AMC	6 ARW	91 ARS	KC-135R	Bolt
	19 ARG	99/712 ARS	KC-135R	Rhet
	22 ARW	344/349/350/384 ARS	KC-135R/T	Caddo/Turbo
	89 AW	1 AS	Various	Venus/SAM
	92 ARW	43/92/96/97 ARS	KC-135R/T	Falls/Earl/Pride/Aspro
AFRES	319 ARW	905 ARS	KC-135R/T	Raid/Exxon
	434 ARW	72 ARS	KC-135R	Mash
		74 ARS	KC-135R	Indy
	452 ARW	336 ARS	KC-135E	Rats
	507 ARW	465 ARS	KC-135R	Okie
	916 ARW	77 ARS	KC-135R	Backy
	927 ARW	63 ARS	KC-135E	Auto/Piston
ANG	940 ARW	314 ARS	KC-135E	Darr
	101 ARW	132 ARS	KC-135E	Maine
	107 ARW	136 ARS	KC-135R	Fuzzy
	108 ARW	141 ARS	KC-135E	Jersey
		150 ARS	KC-135E	Topcat
	117 ARW	106 ARS	KC-135R	Dixie
	121 ARW	145 ARS	KC-135R	Tazz/Gorky
		166 ARS	KC-135R	Sluff
	126 ARW	108 ARS	KC-135E	Coder
	128 ARW	126 ARS	KC-135R	Upset
	134 ARW	151 ARS	KC-135E	Soda
	141 ARW	116 ARS	KC-135E	Expo
	151 ARW	191 ARS	KC-135E	Utah
	154 ARW	203 ARS	KC-135R	Hoku
	155 ARW	173 ARS	KC-135R	Husker
	157 ARW	133 ARS	KC-135R	Pack
	161 ARW	197 ARS	KC-135E	Copper
	163 ARW	196 ARS	KC-135R	Grizzily
	168 ARW	168 ARS	KC-135R	Chena
	171 ARW	146 ARS	KC-135E	Steel
		147 ARS	KC-135E	Shaky
	186 ARW	153 ARS	KC-135R	Keys
	190 ARW	117 ARS	KC-135D/E	Tempo
AETC	97 AMW	55 ARS	KC-135R	Spatz/Gassr
USAFE	100 ARW	351 ARS	KC-135R	Quid
PACAF	18 Wing	909 ARS	KC-135R	Tora
AFMC	4950 TS	4952 TS	Various	Ager

Abbreviations used in this column

AFB	Air Force Base	INS	Immigration and Naturalization Service
AIG	Address Information Group	IRA-ARQ	International reference alphabet diplomatic data burst teleprinter system
AM	Amplitude Modulation	MARS	Military Affiliate Radio System
ANDVT	Advanced Narrowband Digital Voice Terminal	Meteo	Meteorology
ARQ	Synchronous transmission and automatic repetition teleprinter system	NCC	National Coordinating Center
ARQ-E	Single-channel ARQ teleprinter system	OET	Office of Emergency Transportation
ARQ-E3	Single-channel ARQ teleprinter system	PACTOR	Teleprinter systems combining certain characteristics of packet radio and SITOR
ARQ-M2	Multiplex ARQ teleprinter system with two data channels	PIAB	Presse- und Informationsamt der Bundesregierung
ASECNA	Agence pour la Securite de la Navigation Aerienne en Afrique et a Madagascar	Qsx	Q Code. I am listening to ...
COMMNAV	Communications/Navigation	RTTY	Radioteletype
CW	Continuous Wave (Morse code)	SAM	Special Air Mission
DLA	Defense Logistics Agency	Selcal	Selective Calling
DV	Distinguished Visitor	SITOR	Simplex teleprinting over radio system
EAM	Emergency Action Message	SITOR-A	Simplex teleprinting over radio system, mode A
FAA	Federal Aviation Administration	SITOR-B	Simplex teleprinting over radio system, mode B
FAF	French Air Force	U.S.	United States
FEC	Forward Error Correction	USA	U.S. Army
FEC-A	One-way traffic FEC teleprinting system	USACE	U.S. Army Corps of Engineers
FF	French Forces	USAF	U.S. Air Force
FN	French Navy	Unid	Unidentified
GHFS	Global HF System	USN	U.S. Navy
HF	High Frequency	USB	Upper Sideband
ICRC	International Committee for the Red Cross	UTC	Coordinated Universal Time
ID	Identification	VIP	Very Important Person

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Time Universal)

- 2892.3 MGJ-Royal Navy Faslane, England, with a 75 baud RTTY CARB broadcast at 2202. (Boender-Neth)
- 3245.0 UCE-Arkhangelsk Radio, Russia, working an unid vessel using 100 baud SITOR-A at 2100. (Boender-Neth)
- 3313.0 HEP3-Kantospolizei Zurich, Switzerland, with CW V marker at 2103. (Boender-Neth)
- 3435.0 Unid NATO (possibly Royal Navy) station transmitting 100 baud RTTY encrypted messages separated by 16 RY's + VMGCTNJHB at 2105. (Boender-Neth)
- 3764.0 PBB-Dutch Navy Den Helder, Netherlands, with a 75 baud RTTY CARB broadcast at 2107. (Boender-Neth)
- 3840.0 SYN2-Israeli Mossad number station at 1645, also on 4665/5628. (Takashi Yamaguchi-Nagasaki, Japan)
- 4002.0 YRR2-Bucharest Meteo, Romania, with 50 baud RTTY synoptic observations at 2106. (Boender-Neth)
- 4031.0 P-Single letter HF CW marker, Russian Navy Kaliningrad at 2108. (Boender-Neth)
- 4050.0 Unid station sending CW single figures separated by a space mark. Ended with three long dashes (short zero's) at 2110. (Boender-Neth)
- 4064.0 EBO-Spanish Navy Vigo, Spain, with CW V marker at 2123. (Boender-Neth)
- 4083.0 Unid multi tone signal (jammer?) from 1935-2125. Also noted one month later from 1830-1920. Also Spanish Navy stations noted here. Sounded like an exercise. Lots of counting and spelling at 1940. (Boender-Neth)
- 4084.0 Strong multi-tone jammer noted at 1830. (Boender-Neth)
- 4227.0 IGJ42-Italian navy Augusta, Italy, with a 100 baud RTTY CARB broadcast at 2120. (Boender-Neth)
- 4240.0 LGW-Rogaland Radio, Norway, with CW traffic list at 2132. (Boender-Neth)
- 4246.0 Unid NATO (possibly Royal Navy) station transmitting 100 baud RTTY encrypted messages separated by 16 RY's + VMGCTNJHB at 2134. (Boender-Neth)
- 4295.0 HWN-FN Pairs, France, with 150 baud RTTY test tape. SXA34-Greek Navy Piraeus, Greece, with CW marker at 2140. (Boender-Neth)
- 4303.0 OXZ-Lyngby Radio, Denmark, with CW traffic list at 2210. (Boender-Neth)
- 4465.0 FDI8-FAF Nice, France, with CW marker at 2144. (Boender-Neth)
- 4485.0 Unid station in CW at 1654 transmitting: 275 275 9T 9T 38 38 plus 5-figure groups, each group was repeated. (Boender-Neth)
- 4495.0 Lancelot worked Firebrick followed by Nightwatch 01 calling Lancelot at 0946. (Haverlah-TX)
- 4550.5 TBU5-Turkish Navy station, unknown location, with CW marker "TBDJ de TBU5" at 2049. (Boender-Neth)
- 4583.0 DKK2-Hamburg Meteo, Germany, with 50 baud RTTY marine weather at 2053. (Boender-Neth)
- 4622.0 Unid station in CW at 2155 transmitting: BT NR47 A 94 23:58:02 1997 BT plus 5-letter groups, many messages. (Boender-Neth)
- 4721.0 Unid station RSSA repeating "V PV2S de RSSA" at 1050 in CW. (Yamaguchi-Japan)
- 4790.0 FDE14-FAF Contrexville, France, with a CW V marker at 1719. (Boender-Neth)
- 4813.0 LZA8-Sofia Meteo, Bulgaria, with 50 baud RTTY synoptic observations at 2150. (Boender-Neth)
- 4880.0 ULX-Israeli Mossad number station at 1700. (Yamaguchi-Japan)
- 5091.0 JSR2-Israeli Mossad number station at 1701. (Yamaguchi-Japan)
- 5117.0 Spanish female 5-digit number station in AM at 0400. Weak but readable on the East Coast. (Gary Seven via e-mail)
- 5141.9 Unid station with a 96 baud ARQ-M2 tuned on space only signal at 1646. (Hall-RSA)
- 5153.8 P-Single letter HF CW marker, Russian Navy Kaliningrad at 1920. (Boender-Neth)
- 5154.0 R-Single letter HF CW marker, Russian Navy Ustinov at 1920. (Boender-Neth)
- 5177.0 Unid station with a PACTOR signal, unable to decode at 1650. Suspect ICRC from Bosnia Herzegovina. (Hall-RSA)
- 5266.5 HEP5-Kantospolizei Zurich, Switzerland, with a V CW marker at 2114. (Boender-Neth)
- 5342.0 FDY-FAF Orleans, France, with a V CW marker at 2115. (Boender-Neth)
- 5383.9 Unid station with a 96 baud ARQ-M2 tuned on space only signal at 1658. (Hall-RSA)
- 5439.5 Unid station L9CC repeating "CP17 de L9CC UAA" in CW at 1256. (Yamaguchi-Japan)
- 5800.0 Mulberry working Nightwatch 01 at 0114. (Haverlah-TX) Spanish female 5-digit number station in AM at 0300. Very weak but readable. (Gary Seven via e-mail)

- 5820.0 YHF-Israeli Mossad number station at 1600. (Yamaguchi-Japan)
- 5887.5 IMB2-Roma Meteo, Italy, with 50 baud RTTY synoptic observations at 2118. (Boender-Neth)
- 5913.9 HLL4-Seoul Meteo, South Korea (tentative), with a 50 baud RTTY broadcasts at 1707. Heavy USB interference. (Hall-RSA)
- 6322.1 ZSD-Durban Radio, South Africa. SITOR-A/B traffic list that also gave the ZSC-Capetown Radio callsign at 1714. (Hall-RSA)
- 6348.0 HWN-FN Pairs, France, with 150 baud RTTY test tape at 0758. (Boender-Neth)
- 6357.0 SAA-Karlskrona Radio, Sweden, with a CQ CW marker at 0756. Also with a CW QSX marker at 2223. (Boender-Neth)
- 6425.0 UGC-St. Petersburg Radio, Russia, with CW QSX marker tape at 2226. Also with a CW QSX marker at 2105. (Boender-Neth)
- 6493.5 LYL-Klaipeda Radio, Lithuania, working an unid vessel in CW at 2220. (Boender-Neth)
- 6697.0 Stiletto with a 20-character EAM broadcast at 2148 and 2207, simulcast on 11267.0. (Haverlah-TX)
- 6730.0 SPAR 19 working Andrews VIP regarding a 0640 arrival at MacDill AFB. Transmission at 0349. (Jones-CA)
- 6768.0 Spanish female 5-digit number station in AM at 0400. Very weak and barely readable. (Gary Seven via e-mail)
- 6826.0 Spanish female 5-digit number station in AM at 0300. Also very weak, but I think it's the same message as 5800 kHz. (Gary Seven via e-mail)
- 6896.7 Unid station with a 96 baud ARQ-M2 tuned on space only signal at 1725. (Hall-RSA)
- 6983.0 Spanish female 5-digit number station in AM at 0200 (Friday UTC). (Gary Seven via e-mail)
- 6993.0 SAM 375 checking Andrews VIP here for possible new primary frequency at 1627. PACAF 01 working Andrews VIP for signal checks regarding possible new primary freq. Checked an omni antenna out of the McClellan AFB remote site around 0215. (Jeff Jones-CA)
- 7586.1 RFVITT-Unid station at 1729 using 92 baud ARQ-E. RFVITT listed as Dzaoudzi, Mayotte Island. Nothing noted on demodulator screen. (Hall-RSA)
- 7767.1 Aveira/Pam/Lubango using SITOR-A at 1628 with Portuguese traffic to CVRRD/PAM/Luanda. (Hall-RSA)
- 7805.5 FDG-FAF Bordeaux, France, with a CW marker at 0802. (Boender-Neth)
- 7831.0 Mulberry working Nightwatch 01 at 0351. (Haverlah-TX)
- 7831.8 5ST-ASECNA Antananarivo, Madagascar, with 48 baud ARQ-E3 aeronautical traffic at 1247. (Robert Hall-South Africa)
- 7841.0 Lancelot worked Firebrick. At 0945 Nightwatch 01 called Lancelot. (Haverlah-TX)
- 7863.5 SPW-Warsaw Radio, Poland, with a CW marker at 0804. (Boender-Neth)
- 7956.0 X2IG-Unid station sending in CW at 0800: SERL DE X2IG for 15 minutes, then off. (Boender-Neth)
- 7983.9 RFTJ-FF Dakar, Senegal, with 48 baud ARQ-E3 Code de Voie on TjF circuit. (Hall-RSA)
- 8032.0 SAM 971 working Andrews VIP with periodic signal checks at 0410. (Jones-CA)
- 8186.0 Spanish female 5-digit number station in AM at 0200. This seems to be very active every Sunday night on the East Coast. Loud and clear. (Gary Seven via e-mail)
- 8192.8 9MR-Malay Naval sending a 50 baud RTTY test tape at 1630. (Hall-RSA)
- 8968.0 McClellan as lead GHFS station with a 39-character EAM (BCVNAT...) at 0145. (Haverlah-TX)
- 9016.0 Mulberry called Nightwatch 01 and then moved to Z150 at 0113. At 0201 Stability called and raised Mulberry. At 0205 Mulberry broadcast a 26-character EAM (RIIARJ...). At 0247 Mulberry broadcast a 79-character EAM (BC5GFJ...). At 1749 Nightwatch 01 called War 46. (Haverlah-TX)
- 9250.8 English female Lincolnshire Poacher number station at 2147. Ray Carmen-Canton, OH, via George Zeller) *Welcome aboard, Ray, and thanks, George, for the forward via e-mail-Larry.*
- 9320.0 Crossbow-3 working Katanna for authentication to enter the net at 0510. Katanna working Mike-Charlie-Tango. Unable to establish comms via cellphone at 0530. (Jones-CA)
- 10046.0 4XZ-Israeli Navy Haifa, Israel, with a V CW marker at 2012. (Boender-Neth)
- 10204.0 Stiletto checking out of the net in the blind at 2348. By 0017 Nightwatch 01 was active on freq and attempting to work an unid station who wanted to enter the net. Moved to 11181.0. (Haverlah-TX)
- 10215.0 HZN48-Jeddah Meteo, Saudi Arabia, with 50 baud RTTY synoptic observations at 2003. (Boender-Neth)
- 10299.2 HSW68-Bangkok Meteo, Thailand, with 50 baud RTTY aero weather and codes at 1310. (Hall-RSA)
- 10551.3 GFL23-Bracknell Meteo, England, with 75 baud synoptic observations at 2006. (Boender-Neth)
- 10935.0 Unid station transmitting ANDVT communications at 0045. (Jones-CA)
- 11053.0 SAM 201 working Andrews VIP with request at 1818. PACAF 01 departed Fort Worth, Texas, ETA Hickam AFB at 0745, working Andrews VIP with phone patch traffic at 0025. (Jones-CA)
- 11181.0 WGY 914 (very strong here) worked Appaloosa Farm (weak) and passed a "Hotel" message. At 1757 Appaloosa Farm called Anathema with no response heard. (Haverlah-TX)
- 11214.0 SAM 375 (DV-2 + 9) working Andrews VIP with phone patch to COMNAV at 1635. (Jones-CA)
- 11220.0 SAM 300, inbound home station, working Andrews VIP regarding a 0415 arrival at Andrews. Transmission at 2246. (Jones-CA)
- 11267.0 Stiletto with a 26-character EAM. At 2148 and 2207 Stiletto with a 20-character EAM simulcast on 6697.0. (Haverlah-TX)
- 11460.0 Casey 01 working Andrews VIP regarding 0105 blocktime at Andrews AFB. Transmission at 2116. Nightwatch 01 radio op working Casey 01 radio op with informal comms at 0240. (Jones-CA)
- 12691.3 FUX-FN Le Port, Reunion Island, with a 75 baud RTTY test tape at 1316. (Hall-RSA)
- 13440.0 SAM 26000 (DV-2 + 26) inbound Yokota AFB, Japan, working Andrews VIP with a phone patch to SAM Command at 0039. (Jones-CA)
- 13878.0 SAM 375 here with a brief signal check for Andrews VIP radio at 1800. (Jones-CA)
- 13936.5 ICRC Geneva using PACTOR at 1556. Unable to decode. (Hall-RSA)
- 13960.0 SAM 27000 on the ground at Yokota AFB working Andrews VIP regarding going off-mike for about 40 minutes at 0450. (Jones-CA)
- 14396.0 SHARES net monitored at 1609 for about 25 minutes. Net control stations were AFA3HY-USAF MARS Shawnee, KS (stated he was SHARES coordination station central) and AAA0USA-USA MARS Tacoma, WA. The bulk of the check-ins were MARS stations, but also heard the following:
AGA6LA-USAF MARS Los Angeles, CA; AAR6SR-USA MARS (New Mexico); AFA2JF- USAF MARS Hudson, FL; AGA5PD-USAF MARS (Oregon); AAR5FD-USA MARS; AAA6USA-USA MARS Fort Sam Houston, San Antonio, TX; DLA303-DLA Bremerton, WA; WGY695 (He said his location was in Illinois); AFA4UB-USAF MARS Slidell, LA; KGD34-NCC Arlington, VA; KAD640-INS Swanton, VT; WUJ5-USACE Anchorage, AK; KWB406-OET Ames, IA; AAR0JN-USA MARS Keno, OR; NNN0NUW-USN MARS Oak Harbor, WA; NNN0QWC-USN MARS; and KIT88-FAA Martinsville, WV. (Gordon Levine-Anaheim, CA)
- 14462.8 TNL-ASECNA Brazzaville, Congo, with a 96 baud ARQ-M2 idling signal at 1144. (Hall-RSA)
- 14801.6 RFVI-FF Le Port, Reunion Island, with a 100 baud ARQ-E3 idling signal at 1137. (Hall-RSA)
- 15041.0 CASEY 01, inbound Hickam AFB, working Andrews VIP regarding a 0320 arrival. Transmission at 0243. (Jones-CA)
- 15743.3 VNA Hanoi, Vietnam, at 0701 with a 50 baud RTTY English news bulletins. (Hall-RSA)
- 15855.8 German embassy Bujumbura (tentative) at 0842 with a 223.7 baud IRA-ARQ transmission. Unable to decode. (Hall-RSA)
- 16078.9 RFVIPP-Air Comis St. Denis, Reunion Island, with French traffic to RFFVA-Air SACA Paris and RFFUEF-Air SERPECA Tours using 100 baud ARQ-E3 at 1105. (Hall-RSA)
- 16808.0 SPH-Gdynia Radio, Poland, with SITOR-B Polish traffic and traffic list at 1500. (Hall-RSA)
- 16829.1 USU-Mariupol Radio, Russia, with SITOR-A traffic at 1614. (Hall-RSA)
- 16836.6 WLO-Mobile Radio, AL, with SITOR-A idler at 1611. (Hall-RSA)
- 16987.9 RFVI-FF Le Port, Reunion Island, with a Code de Voie 100 baud ARW-E3 transmission at 1048. Circuit ID was CRE. (Hall-RSA)
- 18320.7 RFTJ-FF Dakar, Senegal, at 1240 with a 192 baud ARQ-E3 Code de Voie transmission. (Hall-RSA)
- 18380.5 RFFAAR-Direcen Prosecurdef Paris, France, with French press news reports to AIG 1038/39 and many others using 100 baud ARQ-E3 at 1010. RFFISOM-Paris Naval with 5-letter groups to RFFVGRN (naval ship at Le Port) using 100 baud ARQ-E3 at 1040. (Hall-RSA)
- 18527.2 NDGA-French embassy N'Jamena, Chad, transmitting a 200 baud ARQ6-90 idling signal and messages (unable to decode) at 0836. (Hall-RSA)
- 18704.4 PIAB Bonn, Germany, with a 96 baud FEC-A German DPA news bulletins at 0842. (Hall-RSA)
- 18755.9 Interpol Wiesbaden, Germany, with SITOR-A traffic in German for New Delhi at 1220. Interpol Tehran with SITOR-A traffic in English to New Delhi at 1244. Interpol Rome with English traffic to New Delhi at 1256 on a wanted Indian subject. (Hall-RSA)

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Respect for Neighbors

Might certainly makes right in the way VOA and other western broadcasters treat SW stations in Mexico and Canada—as if they don't exist. With powers ranging from 50 watts to 5 kW, and permanently assigned frequencies, our NAFTA neighbors don't have the clout to muscle off interference, and their channels are often blocked. Just try to hear the active Canadians on 6005, 6030, 6070, 6130, 6160, or the Mexicans on 5985, 6010, 6185, 9705.

Why is WYFR on 5985 when XERMX needs it? VOA and RFE/RL use 9705 most of the day from a variety of sites; even

Greece to Pakistan is a problem here next to Mexico at 0100. Deutsche Welle uses 6185 much of the night.

It seems our neighbors do not have anyone representing their interests at frequency coordination conferences, but the big guns can hardly pretend they are unknown. Mexican and Canadian frequencies should be deliberately avoided; on SW they are too close to be shared. At least some of the Mexicans are trying to increase their power, but they shouldn't have to fight off uncaring Yankee interference.

ALASKA KNLS has been broadcasting for R. Free Asia since January (Mike Osborne, KNLS English programmer) 2100-2200 Chinese 11765, 2200-2300 Korean & 2300-2400 Chinese on 11785 (Nikolay Rudnev, Russia, NASWA *Listeners Notebook*)

ANGOLA V. of the Resistance of the Black Cockerel. UNITA opposition station from Jamba, VORGAN, 0450-0900 on 7090v, 1050-1430 9770, 1650-2100 5985 including irregular English at 1830-1845 (BBCM)

ARGENTINA R. Armonía, 4800.1 at 0743, jazz //stronger 3200, both harmonics (Paul Ormandy, NZ, *Cumbre DX*)

LS11, La Plata, on 1270 MW has a program *De Colección* on SSB SW beamed to Antarctica Sun *2300 to Mon 0200, on one or two of: 3390, 4469, 5400, 5415, 8098, sometimes delayed by soccer (Raymundo Cruz, La Plata via Barrera) Also try 13361 or 13365 (Jorge Aloy via Barrera) Includes listener call-in at 0115-0130 with cassette prizes; will QSL reports to: Sr. Jorge Bourdet, Casilla 96, 1900 La Plata. Include 2 IRCs (Gabriel Iván Barrera, BC-DX)

ARMENIA V. of Armenia. English to Americas and Europe at 2030-2100 on 9965 [only]; signature tune is *Spring* by Father Gomitás, an Armenian monk who in his short life composed thousands of songs and melodies, based on Armenian folk tunes. He died in 1915, during the first days of the Armenian genocide, among 600 intellectuals who were massacred first. After ID in Armenian, *Yerevane Khosoum*—Yerevan is speaking—opening melody is *Dance of the Rose Maidens* by Khachaturian (VOA Canada Bureau) 9965 is a megawatt from Kamo, blasts into Europe but overmodulated (Kai Ludwig, *Cumbre DX*)

AUSTRALIA Jean-Gabriel Manguy has been appointed new Network Manager of Radio Australia from Sept 19; has worked in Asia and Pacific in English and French services (RA news online via Daniel Say, *rec.radio.shortwave*) The Asian Relations minister for the Northern Territory, Eric Poole, has called on the federal government to review its decision to close RA transmitters near Darwin (RA via BBCM) Frequencies opting out for *Grandstand* ball game coverage Sat/Sun: 17750, 15510, 15240, 12080 (via BBCM) Sat 0200-0800, Sun 0300-0800, one hour earlier Oct-Mar (RA via BC-DX) From Aug 24, RA added 0600-0830 11880 to Pac (Arie Schellaars, RA via *Electronic DX Press*)

HCJB has been given property in Kununurra, WA, and the mission is investigating the possibility of establishing an international broadcasting facility on this site (HCJB World Radio-Australia Newsletter via *Cumbre DX*)

BELGIUM RVI's International Listeners' Club will be cancelled at end of October due to budget cuts, but QSLs will still be issued (RVI *Radio World* via Steven Cline)

BOLIVIA SIM International, whose ELWA was destroyed twice in Liberia, is setting up a new SW station in Cochabamba for the Quechua-speaking highland and valley people. Transmitter expected soon, to use an "H" antenna beaming upwards for close-in coverage, target first half of 1998 if licensed soon. Name means "new messenger" (HCJB *DX Partyline*) Sounded like R. Montochaski, per Paul Erickson interview on DXPL (Jerry Berg, *Electronic DX Press*)

BOUGAINVILLE R. Free Bougainville heard on 3865 from 1104 to 1154* with island to rock music. IDs at 1116, 1152, s/off with chorus of men and women, anthem? (Hans Johnson, ID, *Cumbre DX*)

BRAZIL R. Dif. Taubaté is back on 4925 after long absence, 500 watts, 24 hours, to increase to 1 kW (de Castro, Brazil, *Cumbre DX*) R. Gazeta presumed, 15325 at 0125-0325 pop music,

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel program-ming; + = continuing but not monitored; 2 x freq = 2nd harmonic; J-97=May-Sept; Z-97=Summer season; W-97=Winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there.*

soap operas, no explicit IDs (Jay Novello, NC)

BULGARIA E-mail to R. Bulgaria may now be sent to the private account of an employee: <lgeorgi@mail.techno-link.com> (R. Bulgaria via Andreas Erbe via Kai Ludwig)

CAMBODIA National Voice of Cambodia is the ID now in English at 1200-1215 on 11940.4 (Roland Schulze, Philippines, *Cumbre DX*)

COLOMBIA Clandestine monitoring: R. Patria Libre, 6250 at 2158-2216 in June, but not in August; instead heard FARC station reactivated after 11 months, Voz de la Resistencia weaker on 6259.2 at 2158-2230 closing with 4-minute vocal version of *La Internacional* (Henrik Klemetz, *Dateline Bogotá* via DSWCI *DX Window*)

COMORO ISLANDS R. Comoro director told me in August they hoped to have technical problems with SW repaired and back on the air in two months, 3331 at 0300-2100 in French, Arabic and Comoro (Mahendra Vaghjee, Mauritius, NASWA *Listeners Notebook*)

COSTA RICA For at least a week in August, RFPI 7385 was hit by bubble-jamming, a year after a previous jamming incident (gh)

CUBA P-mail from Europe to RHC takes two to six months before reaching the station, partly because a governmental service takes a very close look at each and every letter coming from abroad! They do receive E-mail but do not answer (Fabien Serve via Francis Mougenez, DSWCI *DX Window*) RHC's 13715 sounds like two unsynchronized transmitters, wobble and audio phase cancellation for English 2030, French 2130 (gh)

CZECH REPUBLIC R. Prague's German, French, and Spanish services close at yearend, leaving only English and Czech (Kai Ludwig, Germany) Future of foreign service unclear, 25% budget cut for 1998; decision in Sept or Oct. The three dropped languages may continue via Internet (Karel Honzik, Czech Rep., DSWCI *DX Window*) Foreign Ministry is seeking new operators for foreign broadcasting and Internet; French and German only on the latter (CTK via BBCM)

ECUADOR [non] Rich McVicar, ex-HCJB, is working the overnight announcing shift weeknights at religious WMHR, 102.9, Syracuse, NY, plus affiliates and translators in western NY: low-key, did not hear him giving his name (Tim Hendel, NY, *World of Radio*) One reason he left Quito was concern about the safety of his family (gh)

EQUATORIAL GUINEA R. Nacional, Bata on 15185.78v at 1055-1638* on a Monday with some live outdoor event, mentioning 5005 frequency (Jay Novello, NC)

ETHIOPIA R. Ethiopia is on 9704.2 with home service from 0300, weak but fair after 0400 until 0600 when Niger comes on 9705.00 a bit stronger heard all day,

Ethiopia sporadically such as around 1200 (Vladimir Titarev, Ukraine, DSWCI *DX Window*) Also Libya has test tone on 9705 at 0700-0930 (Wolfgang Büschel, BC-DX)

[non] V. of Oromo Liberation via Ukraine on new 9490 ex-9925 at 1705-1755*, nice music but co-channel VOR in Italian (Finn Krone, Denmark, DSWCI *DX Window*) Mon/Wed/Sat (Hans Johnson, *DXing with Cumbre*)

RADIO BULGARIA



ČESKÝ ROZHLAS



FRANCE R. Nostalgie-Neige, NBFM on 25900 was heard again in August, first time since spring 1995, not yet on 26040 and 26070 (Lindenthal, Germany, DSWCI *DX Window*) From ski resorts (gh)

RFI finally announces E-mail address: <english.service@rfi.fr> (Mike Cooper, GA)

GERMANY Brother Stair heard at 0100-0200 on 9855 not //WWCR, WRNO; from Deutsche Telekom (George Thurman, *rec.radio.shortwave*) Also at 0400 on 9475 (Michael Rathbun, *ibid.*) DT obviously has no taste about whom they sell time to (gh) Test was during August mostly with tapes, not live feed (Jim Moats)

GREECE VOG from July 1 using four frequencies to NAM at 0000-0350--6260, 7450, 9420, 11645. Believe they were looking for two more channels to be used by VOA USA relays at this time and one at 2200-2350 (John Babbis)

INDIA All India Radio has a new website: <http://www.allindiaradio.org/> (Jim Frimmel, TX)

INDONESIA Lots of station info and photos appear on this new website: <http://www.qsl.net/yb0rmi> Clandestine page also resides here (Nick Grace, Indonesia, *rec.radio.shortwave*)

IRAN A large SW site at Sirjan, south central Iran, has been opened by Pres. Rafsanjani (IRNA via BBCM) Believed 10 x 500 kW and directional arrays, but despite this and another large new site near Mashhad, of a total 28 very high power transmitters per Transmitter Documentation Project, only four are heard at any one time (BBCM)

[non] The Flag of Freedom Organization, which previously operated a SW clandestine, is still quite active on Internet: <http://www.iranffo.org/> (Nick Grace, Indonesia, *Cumbre DX*)

IRAQ Baghdad, R. Iraq International, revived English Aug 11 after many months' absence, 11785 around 2230-2300 after French; bad modulation and interference, news about Saddam. Frequency also on after 0230, Arabic (gh) English time varies, one day at 2220-2235* Sounds like everything is recorded about 3 meters away from a studio mike (Daniel Atkinson, UK, *swtalk*) First appeared on 11292, then 11290, Baghdad's General Service in Arabic with ID after news at 2015 (Bob Hill, MA, via Al Quaglieri, NASWA)

Iraqi News Agency radioteletype service, F1B 75 baud to Mideast on 10162.5: English daily 1000-1400; Arabic 1400-2100 daily, 0600-1000 exc Fri but during crises as early as 0400; one hour later in winter (BBCM)

IRELAND The real problem with Emerald Radio's mail being returned by the PO, which has continued, it turns out, is that a zone number of 1 is required after P.O. Box 200, Dublin (Finbarr O'Driscoll, Ireland)

ITALY AWR Forlì 2.5 kW transmitter will run DX test for NAM UT Sept 28 and 29 at 0100-0300 with *Wavescan* episodes, special QSL, frequency TBA (Adrian Peterson, AWR) How about 7230 as before?

KUWAIT News bulletins from R. Kuwait are now on RealAudio: <http://www.radiokuwait.org/> (BBCM) English 1800-2100 on 11990 reformatted, starts with news (Eugene Gebeurs, RVI *Radio World*)

LAOS Only active SW are Xam Nua, Houa Phan on 4690 ex-4660 till 0000 and 1000-1100; Luang Prabang on 6975; National Service from Vientiane on 6130. External service on MW 1030 only, not announced 7145 or 7116v (Maarten van Delft, Laos, DSWCI *DX Window*)

LIBERIA VOA African Service interviewed someone in the management of Star FM, Monrovia, who said plans called for development of a SW relay at some future time, but not a high priority. It will happen, but not right away (B. Cooley, BC, *World of Radio*)

LIBYA Great Jamahiriya Radio, Tripoli in Arabic: 1229-1645 on 15435, 15415, 15235. Sabha Local Radio, 0745-1000v irregularly on 11815. V. of the Greater Arab Homeland, external service in Arabic: 1645-0400 and 1045-1230 on 15430, 15230; 15415 at 1800-0400, 1045-1230. At 1600-1745 15415 carries *Green Book* readings in Russian, German, Hungarian, Polish, Bulgarian, Czech/Slovak, Romanian, Serbo-Croat, each on a certain 2, 3 or 4 days of each month, except for Russian on 7 days (BBCM) see also ETHIOPIA

LITHUANIA R. Vilnius now on RealAudio including English 1900-1930, 2130-2200, at <http://www.lrtv.lt/lr1.ram> by pointing an RA player to pnm://lr.lrtv.lt/lr1.ra (Sigitas Zilionis, Lithuania) 9710 and MW 666 cause a mixing product on 10376 with audio from 666 (Andreas Erbe, Germany via Kai Ludwig) Also on 9044 (Wolfgang Büschel, BC-DX)

MADAGASCAR A private station with an address in Tana is Tsioka Vao, on 6075 at 0300-1900 in Malagasy and French with pop music. Director is a Malagasy, Detkou Dedonnais (Vaghjee, NASWA *Listeners Notebook*) Later: 0300-1900 on 6075, then another frequency evenings. Many private and religious FM stations in Madagascar test on SW occasionally. Music heard on 5950 was first thought to be another one (Vaghjee, *Cumbre DX*)

MALI As of mid-August, CRI relays in English at 0000, 0300 had been missing for a month on 9710, 11695v, nor heard on previous frequencies 9770, 9780, 11715, 11760 (Ivan Grishin, gh) Also heard on 11770v at 0000 (BBCM) *Not here* (gh)

MAURITIUS MBC is not on SW in spite of last month's 9710 report, per Mr Pather, C.E. (Mahendra Vaghjee, *Cumbre DX*)

MEXICO XERTA began testing at 2300 Aug 12 on 4800, all night with music and IDs, less than 2 kW (Héctor García B., DF) Heard the following night with open carrier

on 4800.7, but the night after that, 0405 with music and many different IDs in Spanish, one claiming 50 kW ERP, another that it's in Spanish, English, and French. 0505-0535 English program about Baja California; also when checked after 1155 with classical music. Bad bet when the Guatemalan is on 4800.2, but separable on USB and R. Transcontinental de América is a bit stronger. But missing the next days (gh, OK) Homemade transmitter; plans to make another for 15120 daytime; also authorized 6110, 9750, 11720, 17720, 17880, 21460, 25620; plans to have DX programs, reports welcome to A.P. 653, 06002 México, DF (Jeff White, *Cumbre DX*)

R. Educación plans to increase power to 50 kW by November. New DX program in Spanish is *Comunicación 6185* per August sked: Wed 0200, Thu 0500, Fri 0600, Sat 0800, Sun 1000 (Héctor García B., DF, *World of Radio*) Blocked by DW and others except on the Sunday time, maybe Saturday, but other programs were heard UT Wed and Thu at 0200 (gh)

Radio Ibero will transmit its programs via XEJN R. Huayacocotla, 2390, from Aug 24. XHUIB is on 90.9 FM with 100 watts, only audible near the Universidad Iberoamericana campus in Santa Fe, D.F. (Héctor García B., *World of Radio*) Several hours a day of program exchange; both are affiliated with Jesuits (Jeff White, DSWCI *DX Window*) UIB has long provided R. Huaya a website, full of info on its troubles with authorities and closedown in Oct 1995, but nothing yet about this relay. Watch out for possible Guatemalan, La Voz de Atitlán, also on 2390; during Sept and Oct WWCR planned to use 2390 from 0300 to 1200 (gh) Both heard in mid-August, Huaya on 2389.95 at 0100-0155, Atitlán on 2390.02; one signed off at 0230* (Bob Wilkner, FL, DSWCI *DX Window*) As soon as WWCR closed at 1201, 2390 had Mexican anthem, mention of Huayacocotla (gh, OK)

R. México Int'l hopes to have another transmitter on the air in the next few months, so it can broadcast English and Spanish simultaneously (Juan Mort via Jeff White, DSWCI *DX Window*) Check new website: <http://www.telecommex.com/imer> (XERMX Mail Box)

MONGOLIA R. Free Asia via Ulan Bator: 0030-0130 Burmese 11580; 1530-1630 Korean 5855; 2200-2300 Korean 7470 or 7460; 2330-0030 Vietnamese 11580 (Nikolay Rudnev, Russia, NASWA *Listeners Notebook*)

MOZAMBIQUE R. Mozambique, 11812.2-11812.4v is regularly heard in 1100-1530v period, including English at 1100-1129. Also as early as 0830 //15291.8 reactivated, heard until 1205 (Mikhail Timofeyev, NERRS, Russia, DSWCI *DX Window*)

MYANMAR [non] Democratic Voice of Burma, from Oslo in Burmese, also Shan, Karen, Kayan, 1430-1455 daily via Norway on 11850; now also 1245-1345 daily via Germany on 15330. URL: <http://www.muniquenue.no/dvb/> (BBCM) Also via RealAudio here (Andreas Erbe, BC-DX) Aborted plans to broadcast via Vladivostok or Tashkent, unsatisfactory (DVOB via DSWCI *DX Window*)

NEW ZEALAND RNZi not likely to be on web audio soon, but domestic RNZ is: www.rnz.co.nz/ (RNZi Mailbox) For Sept a new RNZi frequency is 9875 at 1850-2050 (Adrian Sainsbury, RNZi)

R. Jemima, which took over the pirate SW transmitter of Kiwi R., changed name to Radio RJK as of Sept 6 (*Kiwi Radio Weekly*)

NIGER See ETHIOPIA

NIGERIA [non] V. of Free Nigeria, Sat 1900-2000 on 11680 is not from Tunisia but no comment on Algeria. Plans include daily transmissions and eventually 24h, but at least a year away. Indianapolis address is because that is where the Secretariat-General of the Free Nigeria Movement is living (Mukhtat Dan'lyan, FNM via Hans Johnson, *Cumbre DX*) Algeria is most likely due to heading and Algerian programming heard on almost the same frequency, 11679.75 until 1901 (Chris Greenway, BBCM) Printed sked valid until 05 Sept for R. Algeria Int'l shows only four frequencies, including new "11750" 50 kW at 1000-1900 to extreme south of Algeria with French network 3, just right for this service during the following hour (gh)

R. NADECO via WWCR changed repeat time M-F to 1945-2000 on 15685, still 0500-0515 on 5070 (gh)

OMAN R. Sultanate of Oman has begun transmitting via Internet, full output at 0200-2130 with 28.8 kbps modems in RealAudio. Also has full feed of TV program at

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same time, all in Arabic, but considering adding English depending on listener input:

http://www.oman-tv.gov.om Top of hour ID *Idha'atu Saltanat Oman* is immediately followed by Big Ben-like chimes (Phillip Dampier, NY)

PAKISTAN R. Pak slow English news at 1100-1120 on new 15520//17865 which was stronger (Erik Koie, Denmark, BC-DX) R. Pakistan is inviting listeners abroad to suggest ways to improve programming. The best listener will get first prize of two free return air tickets to visit Pakistan, including stay in the country (R. Pak via BBCM)

PARAGUAY R. Nacional, 9738, has a new address: Blas Garay 241, c/o Iturbe, Asuncion (Horacio Nigro, Uruguay; J. Oscarsson, *Distance* via *Play-DX* via *The Four Winds*) SW takes a break at 1800-2100. Programming is for local and regional audiences, but broadcasts in foreign languages for international audiences are being planned (José Carlos Carbajal, Uruguay)

PERU R. Chasqui, Cusco, 6087.9, new station first heard Aug 7 at 1240-1301*, 0046-0100, 1130- with ID at 1200, 1229, *0000, fairly strong; sked seems to be 1130-1300, 0000-0200. Name means messenger in Quechua. McVicar says E-mail is: <dmuthcz@amauta.rcp.net.pe> (Henrik Klemetz, *Dateline Bogotá* via DSWCI DX Window)

R. Ilucán, Cutervo, Cajamarca on new 5789.85 at 0135-0310* and at 1045. A week later it had moved again, to 5629.82, religious talk 0200-0230, music to 0310* (Jay Novello, NC)

R. Master on 5767.1 at 1151 is the successor to stations named Estación Soritor, R. Estelar and R. Universal (Henrik Klemetz, *Dateline Bogotá* via DSWCI DX Window)

R. Naylamp on new 5728.5 ex-5342 at 2320 and 1100 announcing 5730, where there is another Peruvian, R. Santiago (Henrik Klemetz, *Dateline Bogotá*)

RUSSIA VOR website offers 1-minute commercials to Europe for \$200; to Asia, Africa, Latin America \$250-300; long-term 15-minute weekly program for \$300 each (Warner & Chepikova, *Cumbre DX*)

V. of Russia in English via St. Petersburg site is on 7130 at 1400-1600 and 9740 at 1600-2200 until Oct 25 (Mikhail Timofeyev, *Electronic DX Press*)

Yeltsin signed a decree liquidating Radio-1 and merging Mayak and Yunost into one station called Mayak, because of funding problems (RFE/RL via Charles Crawford, *Cumbre DX*)

Sakhalin Radio, Yuzhno-Sakhalinsk, uses 11840 and LW 270 at 1800-1500 relaying Radio Russia in Russian, except for local program at 2000-2130, 0800-0840; one hour later in winter (BBCM)

Magadan Radio on 9600, 9530, 7320, 5940 and LW 234 relaying R. Russia in Russian 1730-1500; includes local program at 1900-2000, 0220-0300, 0620-0700: Radiostantsiya Tikhoy Okean from Vladivostok at 0715-0800; one hour later in winter (BBCM)

Vladivostok Radio, 2nd Program on 5015, including relays of first program on LW, FM: 1800-2200, 0700-1300; one hour later in winter (BBCM)

SRI LANKA [non] IBC, the Tamil station in London tested unsuccessfully via Tajikistan in May, but was going to try Georgia on 15075 at 1330-1430 (Victor Goonetilleke, Sri Lanka, RNMM) ID as IBC Tamil at 1403, 1425, heard at 1355-1440* (Ed Rausch, NJ, *Cumbre DX*)

SWEDEN R. Sweden heard saying that three foreign languages would probably disappear, but keep English and German (Charles Stegall, NC)

TAHITI On a visit here in July, I found that the RFO offices had moved from downtown Papeete toward the Faatua airport on a mountainside. A large beam antenna pointed up the Society Is chain was spotted at another location just west of the airport. In this area 15167v registered only strength 3 out of 5 on my YB-400. I was referred to Emile Jordan of RFO who said it was about 5 kW on 15170 and they were waiting or hoping to hear from RFO HQ about a new transmitter (Pete Costello, Tahiti) After this, fair carrier, hum, almost no audio on 15167.46 around 0305 (Randy Stewart, MO)

TATARSTAN R. Tatarstan, Kazan, has a new daily service at 0800-0900 on 9690 in Tatar except for Russian news at 0813-0819 and weather at 0856-0857 (BBCM) Deamed toward St. Petersburg, NW Russia (Mikhail Timofeyev, Russia, DSWCI DX Window) Also 0400-0500 on 9690, 0600-0700 on 6130, all via Samara (Timofeyev via Kenny, BDXC)

TIBET [non] V. of Tibet planned to add a morning service at 2230-2300 on 7120 (Victor Goonetilleke, Sri Lanka, RNMM)

TONGA TBC returned to SW 5030 in early June with all-night broadcasts but ceased in mid-June as Cyclone Hina took out antennas and satellite link. The latter was awaiting repair by BBC technicians from Australia. TBC was anxious to return to SW, per Dep Gen Mgr Mgalu Susimalohi (Rich Hankison, *Cumbre DX*)

TURKEY V. of Turkey has an essay contest on Anatolia as "The Cradle of Civilization." Winners get a one-week trip for two to Turkey. More info from VOT, P.O. Box 333, 06443 Yenisehir, Ankara (RVI *Radio World* via Steven Cline)

Turkish Police Radio, Ankara, 0450-1600 on 3730, may be extended on occasion, mainly music. Mainly music with weather on the hour is Voice of Meteorology, Ankara, on 6900 at 0400-0850, 1100-1545, both one hour later in winter (BBCM)

UKOGBANI BBC is spending \$25M on reorganizing 42 international news bureaus and establishing seven regional hubs: Brussels, Moscow, Delhi, Johannesburg, Washington, Jerusalem, and Hong Kong (Reuters via Hans van den Boogert, *hard-core-dx*) *Pause for Thought* features alternatives such as Humanism, Bahai'i, non-religious speakers on Wednesdays such as 1925 on 12095 (*Write On*, gh)

UKRAINE Tnx to tip in BC-DX, RUI's DX program formerly on Wed now confirmed on Sat around 2130 on 12040, Sun 0030 on 7150, sometimes same program on consecutive weeks, once called *Radio Page for DXers*, then *Whole World on the Radio Scale* but mostly about Ukraine stations (gh)

URUGUAY SODRE, reactivated on 9621 at 0950-0300 with about 250 watts, halfwave dipole, simulcasting MW 1050. *Radioactividades* is Sat and Sun 1400-1500; report to Casilla 7011, Montevideo, or E-mail <radioact@chasque.apc.org> (Horacio Nigro)

USA R. Free Asia's seventh language, Lao, was to start August 18: 2200-2300 on 5930, 9940, 9975; 1130-1230 on 9905, 15170, 17810. That leaves Cambodian still to be implemented per the original mandate (*World of Radio*) See also ALASKA, MONGOLIA (gh) Uighur nationalists met with State Department and VOA in Washington about beginning Uighur language broadcasts to the Xinjiang-Uighur Autonomous Region of China. VOA said it and RFA are considering this (*Golos Vostochnovo Turkestana*, Kazakhstan via BBCM)

Chuck Harder, in his *For the People* magazine received August 6, says "A 'monster' 50,000 watt Continental 317-C-2 radio transmitter has been purchased and will soon arrive at a 39-acre site near Lake City, Florida. There the SW station will be built as well as a repeater for WFVR 910 AM, Valdosta GA. The new SW will beam our program to the East Coast during prime time and will be repeated three hours later for the West Coast." Also says he hopes to continue present sked on WHRI, WWCR. SW station would be owned by American Community Oriented Radio Network, ACORN, affiliated with Harder. It also owns WFVR and WNTF 1580 Bithlo FL. Says ACORN will also make SW radios (Joel Hermann, IA, *World of Radio*)

WVHA, which took the town of Greenbush to court to get tax-exempt status, has been shut down after failing to pay its bills (*News from Every State*, *USA Today* via Malcolm Kaufman) All transmissions ceased July 16; Bangor Hydro-Electric disconnected electricity even to tower lights July 18; finance company took over July 31; employees terminated and security company contracted to secure site Aug 4 (*rec.radio.shortwave*) Finova says it would like to sell WVHA intact, but if that's not possible it will be sold in pieces. The facility would be great for reaching mariners in the Atlantic to do a request show (Kim Elliott, VOA *Communications World*) Church's mailing list numbers 10,000; WVHA had been on the market for over a sesquiquial (Dawn Gagnon, *Central Maine Morning Sentinel* via James Bean, and AP via *Portland Press Herald* via Edouard Provencher)

WSHB and KHBI website has been moved to The Mother Church's: <http://www.tlccs.com> (C. Ed Evans, WSHB) *They sure took forever to publish their language schedule, not that it really matters any more* (gh)

FCC database says control of WRNO has involuntarily changed from the late Joe Costello to Ashton R. Hardy, co-executor—a rep of creditors? (Harry Helms, *DXing.com*)

Another Florida NBFM is on 26350 at 1725-1830+ during sporadic E, in Spanish, mentions WSCV TV 51 Telemundo, but seems to be radio program, not TV audio (Charles Crawford, KY, *Cumbre DX*)

WORLD OF RADIO on WGTG, UT Tue 0400 on 5085-USB, may get additional unscheduled airings if the tape arrives before Monday, such as UT Mon 0515 on 5085-USB, or possibly during the day Sat/Sun on 9400. Changes on WWCR: Sat 0530 and 0605 broadcasts replaced by 0600 on 3210, 5070; Sun 2330 replaced by Mon 0300 on 3215. Remember *WOR* on WGTG, WWCR and much other SW programming shifts one UT hour later from Oct 26, also winter freq shifts (gh) See *WOR* sked and more on www.grove.net/~ghauser/

[non] Yesterday-USA Satellite Radio Network soon will add a very large SW transmitter, which will serve the world as the WWW is already doing (Tom Heathwood, YUSARN, *Radio World*) Presumably refers to the *Electra* project; I didn't think it was 'very large' (gh) On Howard Stern show, Allan Weiner said the tug *Electra* is being outfitted at a shipyard in Boston, ready to set sail by end of summer to Caribbean (*PiPa*)

Eternal Word TV Network of Mother Angelica has been denied permission to be carried on Canadian cable and satellite. The CRTC ruling came after objections such as this from outspoken Toronto Catholic Joanna Manning: "Those of other faiths or whose consciences may differ from the doctrinaire interpretations of morality offered by Mother Angelica are treated with contempt and often outright hostility..." (Leslie Scrivener, Toronto *Star* via Ivan Grishin, Mike Cooper)

UZBEKISTAN R. Tashkent

In English: As 0100 on 9715, 9530, 9375, 7190; 1200 & 1330 on 15295, 9715, 7285, 7190; Eu 2030 & 2130 on 9545, 9540 (BBCM) *Until the Next, Best of DX and 73 de Glenn!*



RADIO TASHKENT

49 Khorezm Street, Tashkent, Uzbekistan
Tel: (312) 33-38-94 Fax: 33-60468

Gayle Van Horn

0000 UTC on 6975

CHINA: Nei Monggol PBS (tentative). Fair heterodyne but very, very weak audio to 0020. (Lee Silvi, Mentor, OH/via email) China's CPBS heard in Chinese on 9080 at 1325. (Zacharias Liangas, Thessaloniki, Greece).

0000 UTC on 7430

UZBEKISTAN: Trans World Radio. Tentative ID for gospel talk and music to subcontinental language. Station has "USSR" test tones, then 12-note interval signal, theme music and sign-on. (Bob Hill, Littleton, MA/DX Report/The Four Winds).

0029 UTC on 15395

THAILAND: Radio Thailand. English to North America with Thai culture program. Signal fade out by 0120. (Silvi, OH)

0050 UTC on 6010

ITALY: RAI. News item on child abuse laws, // 9675, 11880. (Bob Fraser, Cohasset, MA; Silvi, OH).

0138 UTC on 5960

CANADA: Radio Japan relay. Discussion on interval signals to the history of Buddhism, //9750. (Brian Boulden, Fairfield, CA/via email).

0215 UTC on 4800

GUATEMALA: Radio Buenas Nuevas. Spanish religious text, no sign of Radio Lesotho tonight. Station IDs and jingles. (Sam Wright, Biloxi, MS)

0230 UTC on 15168

TAHITI: RFO Tahiti. Very weak signal quality nightly for island music and French/Tahitian talk. Nightly checks usually audible to around 0300, some, however, only a heterodyne. (Silvi, OH)

0309 UTC on 5009.53

MADAGASCAR: RTV Malagasy. Presumed French service with fair to poor signal quality. Pop song to jingle and lady's mention of Madagascar. (Giovanni Serra, Rome, Italy/The Four Winds). RTV noted on 5009 at 1830 in presumed Malagasy. Music and features to national anthem at 1903. (Mark Veldhuis, Borne, Netherlands/Hard Core DX).

0315 UTC on 15115

NEW ZEALAND: Radio New Zealand. Discussion on the various gardening books on the market. (Sue Wilden, Columbus, IN) Report on NZ's aid to Niue Island at 0915 on 6100. (Fraser, MA)

0412 UTC on 7485

NORWAY: Radio Norway Int'l. News item on farming to sports roundup. (Boulden, CA) English ID at 1600 on 13805 into Norwegian service. (Wilden, IN) RNI noted at 2312 on 9965 in English. (Fraser, MA)

0458 UTC on 4919

ECUADOR: Radio Quito. American tunes in Spanish with good reception. Three time pips at 0500 to station promotional and commercials. (Boulden, CA; Serra, Italy/TFW).

0600 UTC on 4815

BURKINA FASO: Radio Burkina. Domestic service in French. Various music selections and "canned" ID and promos. (Steve Keithley, NM/Cumbre DX).

0602 UTC on 5076.7

COLOMBIA: Caracol. Spanish programming including ID with commercial jingles. RTTY interference in USB, occasional Morse-code interference. (Veldhuis, NLD/ Hard Core DX).

0738 UTC on 4985

BRAZIL: Radio Brazil Central. Portuguese. Latin American music and chat for poor reception. Station ID at 0903 by male, mention of capital and Brasilia items. (Dan Ziolkowski, NY/Cumbre DX).

0945 UTC on 9580

AUSTRALIA: Radio Australia. Report on the social life of youths in rural areas. (Fraser, MA)

0947 UTC on 6000

BRAZIL: Radio Guaiba. Portuguese. News of Brazil to music program and studio announcements. Piano version of *Midnight Special* to ID, musical promotional and time pips at the hour. (Ziolkowski, NY/Cumbre DX)

1040 UTC on 11715

CANADA: Radio Korea Int'l relay. *Notes on Nostalgia* on Chong Da Suk, modern composer of traditional Korean music. **Radio Japan's Canadian relay** noted on 6120 at 1135; **RCI** audible on 13650 at 1210; **BBC WS Canadian relay** on 9515 at 1515 with *The Four Caliphs*. (Fraser, MA)

1154 UTC on 9705

NIGER: La Voix de Sahel. Native singing to drums signal. Time check and news in French. Next day's signal was very good at 0845, heard in vernacular language to French ID at 0900. Earlier check of 9705 heard 0758-0803 (Veldhuis, NLD).

1310 UTC on 6265

MALAWI: MBC. Chat in Swahili to African music and lengthy text. English religious songs to sermon format. Lady's announcement to bird sound effect

for interval signal. Time pips to station ID at 1405. (Mahendra Vaghjee, Rose Hill, Mauritius) MBC audible on 3380 at 2130 in English. (Giampiero Bernardini, Chieti, Italy/TFW)

1355 UTC on 2580

INDONESIA: RSPDT2 Timor. Presumed Indonesian with island style music and two mentions of Timor at 1400. (Tom Banks, Dallas, TX).

1417 UTC on 9750

MALAYSIA: Voice of Malaysia. News and information with SINPO=22432. (Liangas, GRC)

1514 UTC on 7490

USA: WJCR Upton, KY. Religious programming and letters from listeners. (Wilden, IN)

1707 UTC on 17830

ASCENSION ISLANDS: BBC WS. English service to Africa noted also on // 15400, 11860. *Focus on Africa* magazine show of current affairs. Station ID at 1721 and letterbox feature. (Serra, Italy/TFW).

1850 UTC on 15050

COSTA RICA: Radio for Peace Int'l. *AIDS Today* program discussing legal implications. (Wilden, IN)

1955 UTC on 9310

GEORGIA: Voice of Hope. Monitored to 2003*. Religious programming with UK address given at sign-off. (Wright, MS)

2000 UTC on 9525

INDONESIA: Voice of Indonesia. English to Europe, making it to North America with a good signal level. Slow-speaking English newscast and features, played by a couple of gamelan sounders. Numerous IDs to Indo pop music. Bassy audio, untroubled by other stations. (Jay Novello, NC/Cumbre DX).

2005 UTC on 7250

VATICAN STATE: Radio Vatican. Commentary on the sanctity of marriage to 2010*. Poor signal. (Fraser, MA; Sam Wright, Biloxi, MS)

2025 UTC on 2325

VL8T-Tennant Creek. Pop music to time checks, "ABC" ID, news and pop tune. //2310 (Alice Springs) and 2485 (Katherine). (Veldhuis, NLD; Vaghjee, MAU; Bernardini, Italy)

2035 UTC on 4890

PAPUA NEW GUINEA: NBC. Weak signal for easy-listening tunes and English/Pidgin text. (Veldhuis, NLD)

2120 UTC on 7250

HUNGARY: Radio Budapest. *DX Program* to IDs and frequency info // 9835. (Wright, MS)

2143 UTC on 7150

INDIA: AIR. General Overseas service with fast-paced subcontinental instrumentals with sitars, violins and tablas. English ID at 2200 into news // 7410 (best), 9910, 11620. (Hill, MA)

2145 UTC on 3396

ZIMBABWE: ZBC. Classic *Black Magic Women* tune by Santana, to vernaculars chat. Sign-off routine at 2200. (Bernardini, Italy).

2146 UTC on 9675

BRAZIL: Radio Cancao Nova. Talk and religious themes in Portuguese. Brazil's **Radio Difusora Amazonas** audible on 4805 at 2354. (Liangas, GRC)

2148 UTC on 3366

GHANA: GBC. Pop music from Swedish group ABBA. Talk to ID and music request segment. (Veldhuis, NLD; Liangas, GRC)

2330 UTC on 6725.6

PERU: Radio Satelite. Spanish announcement with IDs, time check and mentions of Santa Cruz. (Wright, MS)

2238 UTC on 5005

MALAYSIA: RTM Sib. Romantic slow songs with fair signal quality. Malaysia's **RTM Kuching** on 4895, // 5005 at 2248. (Bernardini, Italy).

2347 UTC on 9630

INDONESIA: RRI Jakarta. Nice pop tunes and Indonesian text, audible to 0010. **RRI Jambi** heard on 4927 at 2350 with references to Malaysia. **RRI Ujung Pandang** on 4753 at 2217 with dangdut songs. (Liangas, GRC)

2350 UTC on 3290

GUYANA: GBC. Good signal for daily obituary report. Pop music tune to local commercials. Hindu style music to 0915 ID as "the Voice of Guyana." Monitored to 0035. (Frank Hillton, Charleston, SC)

Thanks to our contributors — Have you sent in YOUR logs?
Send to **Gayle Van Horn**, c/o *Monitoring Times* (or e-mail gayle@grove.net)
English broadcast unless otherwise noted.

Radio St. Helena Day Nears

As each October arrives, DXers eagerly await Tony Leo's special broadcast of Radio St. Helena...and this year is no exception!



Mark your calendars this month for October 26, broadcasting on 11092.5 SSB from 1900-2300 UTC.

The station website may be accessed at <http://www.sthelena.se/>. Links include tourist attractions, *The Picture Gallery* and *Discover St. Helena*, plus more. Philatelic collectors can link to the remote island's stamp collection with information on how to obtain their popular stamp service.

The *History of St Helena* is available as well as how the unique

broadcast began. Radio St. Helena welcomes you to their email list, too. Homepage updates and other projects are posted via email.

To subscribe, just send email to: majordomo@kajen.com with

the text at the first row in the text box as: *subscribe sthelena your@emailaddress*. All letters to the St. Helena mailing list may be sent to: sthelena@kajen.com.

Questions or suggestions on how to improve the mailing list should be sent to John Ekwall at: joe@sthelena.se or Lennart Deimert at: ld@sthelena.se.



John Ekwall

BENIN

ORTB Cotonou, 4870 kHz. Full data QSL card unsigned. Received in 56 days for a taped report. Station address: Boite Postal 366, Cotonou, Benin. (Eric Bueneman, Hazelwood, MO/*The Four Winds*).

BOLIVIA

Radio Eco, 4702 kHz. San Borja QSL signed Gonzalo Espinoza Cortez-Director. Received in 270 days for a Spanish follow-up report. Station address: Correo Central, Reyes, Ballivian, Beni, Bolivia. (V. Korinek, S. Africa/*TFW*)

COLOMBIA

La Voz del Guaviare, 6035 kHz. Partial data card, postcard and personal letter from Luis Fernando Roman R., Director. Received in 56 days for a Spanish report. Station address: Carrera 22 con Calle 9, San Jose del Guaviare, Colombia. (V. Korinek, S. Africa/*TFW*)

ETHIOPIA

Radio Ethiopia, 7165 kHz. Full data blue logo card unsigned. Received in 90 days for an English report and one IRC. Station address: P.O. Box 654, Addis Ababa, Ethiopia. (Mahendra Vaghjee, Rose Hill, Mauritius)

GERMANY

West Coast Radio Ireland, 5910 kHz (Julich, Germany). Large partial data *Cliffs of Moher* card with form letter and schedule. Received in 6 months for an English report and two IRCs. Station address: Claremorris, County Mayo, Ireland. (Bill Wilkins, Springfield, MO)

JORDAN

Radio Jordan, 6035 kHz. Full data card with schedule included, signed by Jawad Zada. Received in 2 years, eight months. Station address: P.O. Box 909, Amman, Jordan. Full data logo card received for 11970 kHz in 62 days. A month later received the same, plus stickers and flag pennant. (Gayle VH, Brasstown, NC)

MALAWI

Malawi Broadcasting Corp., 3380 kHz. Frequency only verification on station letterhead, signed by E.K. Lungu. Received in 44 days for a taped report, self addressed envelope (used in reply), one US dollar and a local station bumper sticker. Station address: P.O. Box 30133, Chichiri House, Blantyre 3, Malawi. (Stewart, MO)

NAMIBIA

Namibian Broadcasting Corp., 3270 kHz. Full data scenery card of NBC TV Centre in Windhoek, also letter and program schedule, veri signer D. Schachtschneider-Manager. Received in 63 days for a taped follow-up report and return mint stamps (not used on reply). Station address: P.O. Box 321, Windhoek 9000, Namibia. (Randy Stewart, Springfield, MO)

NETHERLANDS ANTILLES

Radio Netherlands Bonaire relay, 6165 kHz. Full data *Media Network* card. Received in 14 months for an English report of 750th edition of *Media Network*, and two IRCs. Station address: P.O. Box 222, 1200 JG Hilversum, The Netherlands. (Wilkins, MO)

NON DIRECTIONAL BEACONS

RR-Suffolk, VA, 249 kHz. Full data prepared QSL card signed by J. Myron Helms-

NavAids Specialist. Received for an report and return mint stamps. Station address: Department of Aviation, Commonwealth of Virginia, 5702 Gulfstream Road, Sandston, VA 23150-2502. (Hank Holbrook, Dunkirk, MD)

CPC-Whiteville, NC, 227 kHz. Full data QSL letter signed by W. Williams-Maintenance Technician. Received in 42 days for an English report and one U.S. dollar. Station address: Columbus County Airport, Whiteville, NC 28472. (Sam Wright, Biloxi, MS)

SHIP TRAFFIC

S/S *Keystone Canyon* KSKF, 12487.5 kHz (Tanker). Full data prepared QSL card verified. Received in 21 days for an English utility report of SITOR traffic. Ship address: Attention: Radio Electronics Officer, c/o Keystone Shipping Co., 313 Chestnut Street, Philadelphia, PA 19106. (Steve McDonald, Mayne Bay, BC Canada)

M/V *Pacific King* 3FJN4, 12439 kHz (Bulk). Full data prepared QSL card verified. Received in 59 days for an English utility report of CW traffic. Ship address: Attention: Radio Electronics Officer, c/o Hyundai Bldg., 96, Mukyo-dong, Chung-ku, Seoul, South Korea. (McDonald, CAN)

S/T *Overseas Ohio* WJBG, 8382.5 kHz (Tanker). Full data prepared QSL card verified. Received in 22 days for an English utility report of SITOR traffic. Ship address: Attention: Radio Electronics Officer, c/o Second Shipmor Association, Maritime Overseas Corp., 511 Fifth Avenue, New York, NY 10017. (McDonald, CAN)

S/T *Overseas Alaska* WEHV, 4077 kHz (Tanker). Full data prepared QSL card verified. Received in 32 days for an English utility report of SITOR traffic. Ship address: Attention: Radio Electronics Officer, c/o Intercontinental Bulk Tank Corp., 511 Fifth Avenue, New York, NY 10017. (McDonald, CAN)

TRAVELERS INFORMATION STATION (TIS)

WQO-767, Dallas-Ft. Worth International Airport, 1640/1680 kHz. Full data QSL folder card signed by Joe Blair-Communications Administrator, Airport Maintenance/Communications. Received in 37 days for an English report and return mint stamps. Station address: P.O. Drawer 619428, DFW Airport, TX 75261-9428. (Stewart, MO)

WVNY-508, Landover, MD, 530 kHz. Full data QSL letter signed by David Buck-Public Affairs. Received for an English report and return mint stamps. Station address: Maryland Department of Transportation, 707 Calvert Street, Baltimore, MD 21202. (Holbrook, MD)

WQC-Camel Church, VA, 884 kHz. Full data prepared QSL card verified. Received for an English report and return mint stamps. Station address: Commonwealth of Virginia, Department of Highway Transportation, 1221 East Broad Street, Richmond, VA 23219-2035. (Holbrook, MD)

WNSH-541, McDowell County, NC, 530 kHz. Full data QSL letter signed by Cindy McPeters-TDA Coordinator. Received for an English report and return mint stamps. Station address: McDowell County Tourism Development Authority, P.O. Box 1028, Marion, NC 28752. (Holbrook, MD)

YUGOSLAVIA

Radio Yugoslavia, 6100 kHz. Full data map/logo card unsigned. Received in 35 days for an English report and one IRC. Station address: P.O. Box 200, Hilendarska 2, 11000 Belgrade, Yugoslavia. (Vaghjee, MAU)

How to Use the Shortwave Guide

1: Convert your time to UTC.

Eastern and Pacific Times are already converted to Coordinated Universal Time (UTC) at the top of each page. The rule is: convert your local time to 24-hour format; add (during Daylight Savings Time) 4, 5, 6, or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (8:30 pm Eastern, 5:30 pm Pacific).

2: Choose a program or station you want to hear.

Some selected programs appear on the lower half of the page for prime listening hours—space does not permit 24-hour listings.

Occasionally program listings will be followed by "See X 0000." This information indicates that the program is a rerun, and refers to a previous summary of the program's content. The letter stands for a day of the week, as indicated below, and the four digits represent a time in UTC.

S: Sunday T: Tuesday H: Thursday A: Saturday
M: Monday W: Wednesday F: Friday

3: Find the frequencies for the program or station you want to hear.

Look at the page which corresponds to the time you will be listening. Comprehensive frequency information for English broadcasts can be found at the top half of the page. All frequencies are in kHz.

The frequency listing uses the same day codes as the program listings; if a broadcast is not daily, those day codes will appear before the

station name. Irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "V" (various languages).

4: Choose the most promising frequencies for the time, location and conditions.

Not all stations can be heard and none all the time on all frequencies. To help you find the most promising frequency, we've included information on the target area of each broadcast. Frequencies beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible. Every frequency is followed by one of these target codes:

am: The Americas	as: Asia
na: North America	au: Australia
ca: Central America	pa: Pacific
sa: South America	va: various
eu: Europe	do: domestic broadcast
af: Africa	om: omnidirectional
me: Middle East	

Consult the propagation charts. To further help you find the right frequency, we've included charts at the back of this section which take into account conditions affecting the audibility of shortwave broadcasts. Simply pick out the region in which you live and find the chart for the region in which the station you want to hear is located. The chart indicates the optimum frequencies for a given time in UTC.

Hot News By Jim Frimmel

Goodbye DST. October is the month we revert to standard time. Thanks to new rules in Europe last year, North America, Central Europe, and the UK all change back the last Sunday of October (the 27th). When referring to our centerfold frequency guide, be sure to keep this fact in mind during the last five days of the month. Not all broadcasters time shift; but, in case you have trouble tuning in a station at a listed time, check one hour later than shown.

According to the Royal Greenwich Observatory, the idea of Daylight Saving Time was first suggested in a whimsical article by Benjamin Franklin in 1784, although implementation first occurred in England during World War I.

National Institute of Standards and Technology. While we're on the subject of time, here's an update on the activities of NIST (formerly known as The National Bureau of Standards) in Boulder, Colorado.

If you are fortunate enough to visit in person, you can take advantage of the free public tour of the Boulder Labs of the Department of Commerce, including the

National Institute of Standards and Technology (NIST) and National Oceanic and Atmospheric Administration (NOAA) laboratories. The 1-1/2 to 2 hour tours are held all year on Thursdays at 1:30 p.m. Additional guided tours are provided during the summer from Memorial Day to Labor Day on Tuesdays at 10:30 a.m. Or, you can take a self-guided tour any weekday from 8:00 a.m. to 5:00 p.m.

Each guided tour consists of a video presentation, a cryogenics (low-temperature physics) demonstration, and visits to the NOAA Solar Forecast Center, the NIST national standard atomic clock, and a working research lab.

If you have internet access, visit the NIST web site (www.boulder.nist.gov) for an on-line tour and additional information.

Take a Virtual Reality Tour of Radio Station WWV. While you're at the NIST web site described above, be sure to visit WWV's web pages off the main site. WWV broadcasts the time and frequency standards from Fort Collins, CO, that are widely used by the general public. You'll need the QuickTime VR plug-in for your web browser to view the virtual reality movies of

the various indoor and outdoor scenes. These are interactive videos: You can float from one room to another in the studio and then pass through a doorway to go outside for a look at the exterior of the building and the antenna farm. Be aware, these files are large and take time to download.

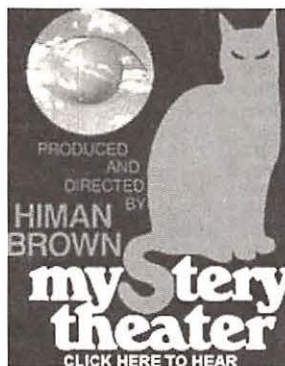
Old-Time Radio. CBS Radio on the internet now offers Himan Brown's original Mystery Theater, the half-hour dramas made for radio to thrill its audiences. These dramas were originally produced between 1974 and 1983, so, to old-time radio buffs, may not actually qualify as old-time radio. You can download the latest episode at

www.cbsradio.com/mystery/default.html. The site also features an interview with Himan Brown about the program.

Wind-Up Computer. The creator of the BayGen Freeplay wind-up radio made the CBS Television Evening News August 20th. British inventor Trevor Baylis had rigged one of his clockwork mechanisms to an Apple eMate 300 computer and was able to obtain several hours use out of a single wind. The eMate features an easy-to-use Newton operating system and long battery life and is a favorite with students.



Selected Programs. This month's program guide features the World Radio Network's internet relays of the transmissions of international broadcasters via network WRN-1 to North America. This is a unique listing! WRN was unable to provide one so we created our own. Remember that you can only hear these programs at these times on the internet using RealAudio (www.wrn.org).



FREQUENCIES

0000-0100	Anguilla, Caribbean Beacon	6090am				0100-0200	Indonesia, Voice of	9525na			
0000-0100	Australia, Radio	9660pa	12080pa	13605pa	13755pa	0100-0125	Iran, VOIRI	6050eu	9022eu	9685eu	
		15415as	15510pa	17750as	17795pa	0100-0200 th	Ireland, W Coast R Ireland	9875am			
0000-0100 vl	Australia, VL8K Katherine	5025do				0100-0110	Italy, RAI Intl	6010na	9675na	11800na	11890na
0000-0100 vl	Australia, VL8T Tent Crk	4910do				0100-0200	Japan, R Japan/NHK World	5960na	11790as	11860as	11890na
0000-0015	Cambodia, Natl Voice of	11940as						13630am	15500as	15590as	17810as
0000-0100	Canada, CBC N Quebec Svc	9625do				0100-0200	Lebanon, Voice of Hope	21610as			
0000-0100	Canada, CFRX Toronto	6070do				0100-0200	Liberia, LCN/R Liberia Int	9960va			
0000-0100	Canada, CFVP Calgary	6030do				0100-0200 smtwh	Malaysia, Radio	5100do			
0000-0100	Canada, CHNX Halifax	6130do				0100-0200 m	Malta, VO Mediterranean	7295do			
0000-0100	Canada, CKZN St John's	6160do				0100-0125	Netherlands, Radio	13605am	6165na	9845na	
0000-0100	Canada, CKZU Vancouver	6160do				0100-0200	Netherlands, Radio	6020na	5905as	7305as	9855as
0000-0100	China, China Radio Intl	9710na	11695na			0100-0200	New Zealand, R NZ Intl	5905as	15115pa		
0000-0004	Croatia, Croatian Radio	5895na				0100-0200 vl	Papua New Guinea, NBC	9675do			
0000-0027	Czech Rep, Radio Prague	5930na	7345na			0100-0200	Philippines, FEBC/R Intl	15450as			
0000-0100	Ecuador, HCJB	9745am	21455am			0100-0200	Russia, Voice of Russia WS	7105na	12010na	12050na	13665na
0000-0030	Egypt, Radio Cairo	9900na						15180na	15595na		
0000-0100 vl	Ghana, Ghana Broadc Corp	3366do	4915do			0100-0130	Slovakia, R Slovakia Intl	5930na	7300na	9440sa	
0000-0045	India, All India Radio	7150as	9705as	9950as	11620as	0100-0200	Spain, R Exterior Espana	6055am			
0000-0100	Japan, R Japan/NHK World	6155eu	6180eu			0100-0200	Sri Lanka, Sri Lanka BC	9730as			
0000-0100	Lebanon, Voice of Hope	9960va				0100-0130	Switzerland, Swiss R Intl	6135na	9885na	9905ca	
0000-0100	Liberia, LCN/R Liberia Int	5100do				0100-0200	United Kingdom, BBC WS	5965as	5970sa	5975am	6085am
0000-0100	Malaysia, Radio	7295do						6145am	6175am	6195as	9410as
0000-0100	Malaysia, RTM Kuching	7160do						9590am	9605as	11750am	11955as
0000-0100	Netherlands, Radio	6020na	6165na	9845na				15280as	15310as	15360as	
0000-0100	New Zealand, R NZ Intl	15115pa				0100-0200	USA, KAIJ Dallas TX	5810am			
0000-0057	North Korea, R Pyongyang	11335na	11845na	13650na	13760na	0100-0200	USA, KJES Mesquite NM	7555na			
		15130na	15230na			0100-0200	USA, KTNB Salt Lk City UT	7510am			
0000-0100 vl	Papua New Guinea, NBC	9675do				0100-0200	USA, KWHR Naalehu HI	17510as			
0000-0100	Russia, Voice of Russia WS	7125na	7250na	7310na	9820na	0100-0200	USA, Monitor Radio Intl	7535na			
0000-0030 mtwhfa	Serbia, R Yugoslavia	9580na	11870na			0100-0200	USA, Voice of America	7115as	7205as	9635as	11705as
0000-0100	Spain, R Exterior Espana	6055am						11725as	15170as	15250as	17740as
0000-0030	Thailand, Radio	9655af	9690af	11905af		0100-0200 twhta	USA, Voice of America	17820as			
0000-0100	Ukraine, R Ukraine Intl	5905na	6010na	6020na	6090na			5995am	6130am	7405am	9445am
		7150na	7180na	7240na	9550na	0100-0200	USA, WEWN Birmingham AL	9775am	13740am		
		9560na	12040na			0100-0200	USA, WGTG McCaysville GA	5825eu			
0000-0100	United Kingdom, BBC WS	5965as	5970am	5975am	6175am	0100-0200	USA, WHRI Noblesville IN	5085am			
		6195as	9410as	9590am	9915sa	0100-0200	USA, WINB Red Lion PA	5745am			
		11750sa	11955as	15310as		0100-0200	USA, WJCR Upton KY	11950am			
0000-0045	United Kingdom, BBC WS	3915as				0100-0200	USA, WJCR Upton KY	7490na			
0000-0030	United Kingdom, BBC WS	7110as	9580as	11945as	15280as	0100-0200	USA, WRMI/R Miami Intl	9955am			
0000-0100	USA, KAIJ Dallas TX	5810am				0100-0200	USA, WRNO New Orleans LA	7355am			
0000-0100	USA, KTNB Salt Lk City UT	15590am				0100-0200	USA, WWCR Nashville TN	3215am	5070am	7435am	13845am
0000-0100	USA, KWHR Naalehu HI	17510as				0100-0200	USA, WYFR Okeechobee FL	6065na	9507am	11550as	
0000-0100	USA, Monitor Radio Intl	7535na	9430sa	15665as		0100-0200	Uzbekistan, R Tashkent	7190eu	9375eu	9530eu	9715eu
0000-0100	USA, Voice of America	7215as	9770as	11760as	15185as	0100-0130		9740eu			
		15290as	17735as	17820as		0100-0126	Vietnam, Voice of	7240na			
0000-0100 twhta	USA, Voice of America	5995am	6130am	7395am	7405am	0130-0150	Greece, Voice of	6260na	7450na	9420na	11645na
		9455am	9775am	11695am	13740am	0130-0200	Netherlands, Radio	5905as	9855as	11655as	
0000-0100	USA, WEWN Birmingham AL	5825eu				0130-0200	Slovakia, AWR Europe	9465eu			
0000-0100	USA, WGTG McCaysville GA	5085am				0130-0200	Sweden, Radio	9435as			
0000-0100	USA, WHRI Noblesville IN	5745am				0130-0200 s	Sweden, Radio	7290am			
0000-0100	USA, WINB Red Lion PA	11950am				0140-0159	Vatican State, Vatican R	5980as	7335as		
0000-0100	USA, WJCR Upton KY	7490na				0145-0200	Albania, R Tirana Intl	6115na	7160na		
0000-0100	USA, WRMI/R Miami Intl	9955am				0200-0300	Anguilla, Caribbean Beacon	6090am			
0000-0100	USA, WRNO New Orleans LA	7355am				0200-0300 twhta	Argentina, RAE	11710am			
0000-0100	USA, WWCR Nashville TN	3215am	5070am	7435am	13845am	0200-0300	Australia, Radio	9660pa	12080pa	13605pa	15240pa
0000-0100	USA, WYFR Okeechobee FL	6085na	9505ca					15365pa	15415as	17750pa	17795pa
0030-0055	Austria, R Austria Intl	9655na				0200-0300 vl	Australia, VL8K Katherine	5025do			
0030-0100	Iran, VOIRI	6050eu	9022eu	9685eu		0200-0300 vl	Australia, VL8T Tent Crk	4910do			
0030-0100	Lithuania, Radio Vilnius	9855na				0200-0210	Bangladesh, Bangla Betar	4880do			
0030-0100	Netherlands, Radio	5905as	7305as	9855as	11655as	0200-0300	Canada, CBC N Quebec Svc	9625do			
0030-0100	Sri Lanka, Sri Lanka BC	9730as				0200-0300	Canada, CFRX Toronto	6070do			
0030-0100	Thailand, Radio	9655va	11905va	15395as		0200-0300	Canada, CFVP Calgary	6030do			
0035-0040	India, All India Radio	7110do	11870do			0200-0300	Canada, CHNX Halifax	6130do			
0050-0100	Italy, RAI Intl	6010na	9675na	11800na		0200-0300	Canada, CKZN St John's	6160do			
0100-0200	Anguilla, Caribbean Beacon	6090am				0200-0300	Canada, CKZU Vancouver	6160do			
0100-0200	Australia, Radio	9660pa	12080pa	13605pa	13755pa	0200-0300	Canada, R Canada Intl	6120am	9535am	9755am	9780am
		15415as	15510pa	17750pa	17795pa			11715am	13670am		
		5025do				0200-0300	Costa Rica, RF Peace Intl	7385am	7585am	15050am	
0100-0200 vl	Australia, VL8K Katherine	4910do				0200-0204	Croatia, Croatian Radio	5895na			
0100-0200 vl	Australia, VL8T Tent Crk	4910do				0200-0300	Cuba, Radio Havana	6000na	9820na	9830na	
0100-0200	Canada, CBC N Quebec Svc	9625do				0200-0300	Ecuador, HCJB	9745am	21455am		
0100-0200	Canada, CFRX Toronto	6070do				0200-0300	Egypt, Radio Cairo	9475na			
0100-0200	Canada, CFVP Calgary	6030do				0200-0250	Germany, Deutsche Welle	7285as	9615as	9690as	11945as
0100-0200	Canada, CHNX Halifax	6130do						11965as	12045as		
0100-0200	Canada, CKZN St John's	6160do				0200-0300 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
0100-0200	Canada, CKZU Vancouver	6160do				0200-0300	Lebanon, Voice of Hope	9960va			
0100-0200	Canada, R Canada Intl	6120am	9535am	9755am	9780am	0200-0300 smtwh	Malaysia, Radio	7295do			
0100-0104	Croatia, Croatian Radio	5895na				0200-0300 s	Malta, VO Mediterranean	15550au	17570as		
0100-0200	Cuba, Radio Havana	6000na	9820na	9830na		0200-0230	Netherlands, Radio	5905as	7305as	9855as	
0100-0127	Czech Rep, Radio Prague	6200na	7345na			0200-0300	New Zealand, R NZ Intl	15115pa			
0100-0200	Ecuador, HCJB	9745am	21455am			0200-0230 m	Norway, Radio Norway Intl	7465na	9560na		
0100-0150	Germany, Deutsche Welle	6040na	6085na	6145na	9640na	0200-0300 vl	Papua New Guinea, NBC	9675do			
		11810na				0200-0300	Philippines, FEBC/R Intl	15450as			
0100-0115	Ghana, Ghana Broadc Corp	3366do	4915do			0200-0256	Romania, R Romania Intl	5990na	6155na	9510na	9570na
0100-0130	Hungary, Radio Budapest	6120na	9580na								

FREQUENCIES

0200-0300	Russia, Voice of Russia WS	11940na 7105na 13665na	12990na 12010na 15180na	12050na 15595na	13645na	0300-0400 0300-0315 mtwhf	Turkey, Voice of Uganda, Radio	7270as 4976do	7300eu	15190au
0200-0300	South Korea, R Korea Intl	7275as	11725am	11810am	15575am	0300-0400	Ukraine, R Ukraine Intl	6020na 5970sa	7150na 6135af	9550na 7325am
0200-0300	Sri Lanka, Sri Lanka BC	9730as				0300-0330	United Kingdom, BBC WS	15360as		9895am
0200-0300	Taiwan, VO Free China	5950na 11825as	7130as 15345as	9680na	11740ca	0300-0400	United Kingdom, BBC WS	3255af 6180eu 9600af 15310as 5810am	5975am 6190af 9605as 17790as	6005af 6195va 11760as 21660as
0200-0300	United Kingdom, BBC WS	5970sa 6195eu 15280as 9590am	5975am 9410va 15310as 9915am	6135af 9605as 15360as	6175am 11955as	0300-0400	USA, KALJ Dallas TX	7510am		
0200-0230	United Kingdom, BBC WS	5810am				0300-0400	USA, KATN Salt Lk City UT	9975am		
0200-0300	USA, KALJ Dallas TX	7555na				0300-0400	USA, KVOH Los Angeles CA	17510as		
0200-0230	USA, KJES Mesquite NM	7510am				0300-0400	USA, KWHR Naalehu HI	5850na	7535af	
0200-0300	USA, KATN Salt Lk City UT	9975am				0300-0400	USA, Monitor Radio Intl	6080af	6115af	7105af
0200-0300	USA, KVOH Los Angeles CA	17510as				0300-0400	USA, Voice of America	7290af	7340af	9575af
0200-0300	USA, KWHR Naalehu HI	7535na				0300-0330 smtwh	USA, Voice of America	4960af		
0200-0300	USA, Monitor Radio Intl	7115as	7205as	9635as	11705as	0300-0400	USA, WEWN Birmingham AL	5825eu		
0200-0300	USA, Voice of America	11725as 17820as	15170as 15250as	17740as		0300-0400	USA, WGTG McCaysville GA	5085am		
0200-0300	USA, WEWN Birmingham AL	5825eu				0300-0400	USA, WHRI Noblesville IN	5745am	7315am	
0200-0300	USA, WGTG McCaysville GA	5085am				0300-0400	USA, WINB Red Lion PA	11950am		
0200-0300	USA, WHRI Noblesville IN	5745am	7315am			0300-0400	USA, WJCR Upton KY	7490na		
0200-0300	USA, WINB Red Lion PA	11950am				0300-0400	USA, WRMI/R Miami Intl	9955am		
0200-0300	USA, WJCR Upton KY	7490na				0300-0400	USA, WRNO New Orleans LA	7395am		
0200-0300	USA, WRMI/R Miami Intl	9955am				0300-0400	USA, WWCR Nashville TN	3215am	5070am	5935am
0200-0300	USA, WRNO New Orleans LA	7355am				0300-0400	USA, WWYR Okeechobee FL	6065na	9505na	7435am
0200-0300	USA, WWCR Nashville TN	3215am	5070am	5935am	7435am	0300-0310	Vatican State, Vatican R	7305na	9605am	
0200-0300	USA, WWYR Okeechobee FL	6065na	9505na			0300-0400 vl	Zambia, R Zambia/ZNBC 1	4910do		
0215-0225	Nepal, Radio	5005do	7165do			0300-0400 vl	Zambia, R Zambia/ZNBC 2	6165do		
0230-0300	Albania, R Tirana Intl	6140na	7160na			0300-0400 vl	Zimbabwe, Zimbabwe BC	3396do		
0230-0259	Austria, R Austria Intl	9655na	9870sa	13730sa		0310-0340	Vatican State, Vatican R	7360af	9660af	
0230-0300	Hungary, Radio Budapest	9840na	11910na			0330-0357	Czech Rep, Radio Prague	9480me	11600as	
0230-0300	Netherlands, Radio	9855as	11655as			0330-0355	Moldova, R Moldova Intl	7520na		
0230-0245	Pakistan, Radio	7255as 17705as	7270as	15120as	15485as	0330-0400 vl	Philippines, R Pilipinas	7730as	13770as	15330as
0230-0300 vl/m-a	Philippines, R Pilipinas	11885me	15120me	15270me		0330-0400 twfha	Portugal, R Portugal Intl	6150am	9570am	
0230-0300	Sweden, Radio	7135na				0330-0400	Slovakia, AWR Europe	11610as		
0230-0300	United Kingdom, BBC WS	7325am	9895am			0330-0400	Sweden, Radio	9430na		
0230-0256	Vietnam, Voice of	7250na				0330-0400	Tanzania, Radio	5050af		
0230-0300 vl	Zambia, R Zambia/ZNBC 2	6165do				0330-0400	United Kingdom, BBC WS	9610af	11730af	11955as
0245-0300	India, All India Radio	6045do	7110do	11830do	15135do	0333-0400 mtwhf	Swaziland, Trans World R	7215af		
0250-0300 sf	Greece, Voice of	6260na	7450na	9420na	11645na	0335-0355 vl	India, All India Radio	7110do	11830do	15135do
0250-0300	Vatican State, Vatican R	7305am	9605am			0340-0350	Greece, Voice of	6260na	7450na	9420na
0255-0300 vl	Zambia, R Zambia/ZNBC 1	4910do				0345-0400	Burundi, Radio Nationale	6140do		11645na
0300-0400	Anguilla, Caribbean Beacon	6090am				0345-0400	Tajikistan, Radio Dushanbe	7245as	9905as	11620as
0300-0400	Australia, Radio	9660pa 15365pa	12080pa 15415as	13605pa 17750pa	15240pa 17795pa	0345-0400 as	Uganda, Radio	4976do		
0300-0400 vl	Australia, VL8K Katherine	5025do				0356-0400	Zambia, Christian Voice	3330af	6065af	
0300-0400 vl	Australia, VL8T Tent Crk	4910do				0400-0500	Anguilla, Caribbean Beacon	6090am		
0300-0400 vl	Canada, CBC N Quebec Svc	9625do				0400-0500	Australia, Radio	9660pa	12080pa	13605as
0300-0400	Canada, CFRX Toronto	6070do				0400-0500 vl	Australia, VL8K Katherine	15510pa	17795pa	15240pa
0300-0400	Canada, CFVP Calgary	6030do				0400-0500 vl	Australia, VL8T Tent Crk	15415as	17750as	
0300-0400	Canada, CHNX Halifax	6130do				0400-0500	Australia, Defense Forces R	5025do		
0300-0400	Canada, CKZN St John's	6160do				0400-0500	Bulgaria, Radio	9485na	11720na	
0300-0400	Canada, CKZU Vancouver	6160do				0400-0500	Canada, CBC N Quebec Svc	9625do		
0300-0400	China, China Radio Intl	9690na	9710na			0400-0500	Canada, CFRX Toronto	6070do		
0300-0400 vl	Costa Rica, Faro del Carib	5055do				0400-0500	Canada, CFVP Calgary	6030do		
0300-0400	Costa Rica, RF Peace Intl	7385am	7585am	15050am		0400-0500	Canada, CHNX Halifax	6130do		
0300-0304	Croatia, Croatian Radio	5895na	9495na			0400-0500	Canada, CKZN St John's	6160do		
0300-0400	Cuba, Radio Havana	6000na	9820na	9830na		0400-0500	Canada, CKZU Vancouver	6160do		
0300-0327	Czech Rep, Radio Prague	5930as	7345as			0400-0430	Canada, R Canada Intl	9715me	11835me	15275me
0300-0400	Ecuador, HCJB	9745am	21455am			0400-0500	China, China Radio Intl	9560na		
0300-0330	Egypt, Radio Cairo	9475na				0400-0500	Costa Rica, RF Peace Intl	7385am	7585am	15050am
0300-0350	Germany, Deutsche Welle	6085na 9640na	6185na	9535na	9615na	0400-0404	Croatia, Croatian Radio	5895na	5920na	9495na
0300-0400	Guatemala, Radio Cultural	3300do				0400-0500 vl	Cuba, Radio Havana	6000na	9820na	9830na
0300-0400 m	Honduras, LV Evangelica	4820do				0400-0500 vl	Cyprus, BRT International	6150do		
0300-0400	Japan, R Japan/NHK World	17685va				0400-0500	Ecuador, HCJB	9745am	21455am	
0300-0400 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do		0400-0450	Germany, Deutsche Welle	5990af	6015af	7225af
0300-0400 vl	Lesotho, Radio Lesotho	4800do						11765af		9565af
0300-0400 vl	Malaysia, RTM Kuching	7160do								
0300-0400 s	Malta, VO Mediterranean	15550au	17570as							
0300-0330 mtwhfha	Mexico, Radio Mexico Intl	9705na								
0300-0325	Netherlands, Radio	9855as	11655as							
0300-0400	New Zealand, R NZ Intl	15115pa								
0300-0310	Pakistan, Radio	7270as								
0300-0400 vl	Papua New Guinea, NBC	9675do								
0300-0330 vl	Philippines, R Pilipinas	11885as	15120as	15270as						
0300-0400	Russia, Voice of Russia WS	7125na 13645na	12000na 13665na	12010na 15180na	12050na 15595na					
0300-0330	S Africa, Channel Africa	5955af								
0300-0400	Sri Lanka, Sri Lanka BC	9730as								
0300-0400	Taiwan, VO Free China	5950na 15345as	9680na	11745au	11825as					
0300-0330	Thailand, Radio	9655na	11905na	15395na						

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FREQUENCIES

0400-0500 tw/hf	Guatemala, Radio Cultural	3300do				0500-0600	Japan, R Japan/NHK World	6110na	7230eu	11840as	11895eu
0400-0500 m	Honduras, LV Evangelica	4820do						11920na			
0400-0415	Israel, Kol Israel	7465na	9435na	17545af		0500-0530	Japan, R Japan/NHK World	13630na	15230na		
0400-0500 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do		0500-0600 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
0400-0500	Lebanon, Voice of Hope	9960va				0500-0600 vl	Kiribati, Radio	9810do			
0400-0500 s	Malta, VO Mediterranean	15550as	17570au			0500-0600	Lebanon, Voice of Hope	9960va			
0400-0430 mtwhf	Mexico, Radio Mexico Intl	9705na				0500-0505	Lesotho, Radio Lesotho	4800do			
0400-0458	New Zealand, R NZ Intl	15115pa				0500-0600	Liberia, LCN/R Liberia Int	5100do			
0400-0457	North Korea, R Pyongyang	15180as	15230as	17765as		0500-0510 mtwhf	Malawi, MBC	3380do			
0400-0430 m	Norway, Radio Norway Intl	7485na				0500-0525	Netherlands, Radio	6165na	9590na		
0400-0500 vl	Papua New Guinea, NBC	9675do				0500-0600	New Zealand, R NZ Intl	9795pa			
0400-0456	Romania, R Romania Intl	5990na	6155na	9510na	9570na	0500-0505	Nigeria, FRCN/Radio	3326do	4770do	4990do	
		11940na	12990na			0500-0600	Nigeria, Voice of	7255af			
0400-0500	Russia, Voice of Russia WS	7125na	12000na	12010na	12050na	0500-0557	North Korea, R Pyongyang	11740as	13790as		
		13645na	13665na	15180na	15445na	0500-0510	Pakistan, Radio	7270as			
		15595na				0500-0600 vl	Papua New Guinea, NBC	9675do			
0400-0430	S Africa, Channel Africa	5955af				0500-0600	Russia, Voice of Russia WS	12000na	12010na	12040na	12050na
0400-0404 mtw	S Africa, Trans World R	7215af						13645na	13665na	15445na	15595na
0400-0430	Slovakia, AWR Europe	9465af				0500-0530	S Africa, Channel Africa	9675af			
0400-0430	Sri Lanka, Sri Lanka BC	9730as				0500-0556	Spain, R Exterior Espana	6055am			
0400-0404 mtwhf	Swaziland, Trans World R	7215af				0500-0530	Swaziland, Trans World R	6100af			
0400-0430	Switzerland, Swiss R Intl	6135na	9885na			0500-0530	Switzerland, Swiss R Intl	6165eu	9535eu		
0400-0430	Tanzania, Radio	5050af				0500-0515	Uganda, Radio	4976do			
0400-0500	Turkey, Voice of	7340na				0500-0600	United Kingdom, BBC WS	3255af	3955eu	5975am	6005af
0400-0415	Uganda, Radio	4976do						6175am	6180eu	6190af	6195va
0400-0500	United Kingdom, BBC WS	3255af	3955eu	5975af	6005af			7120va	7160af	9410va	9600af
		6175am	6180eu	6190af	6195eu			9610af	9740as	11760as	11940af
		7160af	9410na	9600af	11760va			12095as	15310as	15360as	15420af
		11955as	12085af	12095va	15280as			15575va	17640af	17760as	17885af
		15310as	15575va	17640af	17790as			21660as			
		21660as				0500-0530	United Kingdom, BBC WS	15280as	17790as		
0400-0430	United Kingdom, BBC WS	9605as	9610af	9895am	11730af	0500-0600	USA, KAIJ Dallas TX	5810am			
0400-0500	USA, KAIJ Dallas TX	5810am				0500-0600	USA, KBTN Salt Lk City UT	7510am			
0400-0500	USA, KBTN Salt Lk City UT	7510am				0500-0600	USA, KVOH Los Angeles CA	9975am			
0400-0500	USA, KVOH Los Angeles CA	9975am				0500-0600	USA, KWHR Naalehu HI	17780as			
0400-0500	USA, KWHR Naalehu HI	17780as				0500-0600	USA, Voice of America	5970af	6035af	6080af	7170va
0400-0500	USA, Voice of America	6080af	7170af	7265af	7280af			7195af	9630af	11965me	12080af
		7290af	9575af	9885af	11965me			13740af	15205va		
		15205va				0500-0500	USA, WGTG McCaysville GA	5085am			
0400-0500	USA, WEWN Birmingham AL	5825eu				0500-0500	USA, WHRI Noblesville IN	5745am	7315am		
0400-0500	USA, WGTG McCaysville GA	5085am				0500-0500	USA, WINB Red Lion PA	11950am			
0400-0500	USA, WHRI Noblesville IN	5745am	7315am			0500-0500	USA, WJCR Upton KY	7490na			
0400-0500	USA, WINB Red Lion PA	11950am				0500-0600 smtwhf	USA, WMLK Bethel PA	9465eu			
0400-0500	USA, WJCR Upton KY	7490na				0500-0600	USA, WRMI/R Miami Intl	9955am			
0400-0500 smtwhf	USA, WMLK Bethel PA	9465eu				0500-0600	USA, WRNO New Orleans LA	7395am			
0400-0500	USA, WRMI/R Miami Intl	9955am				0500-0600	USA, WWCR Nashville TN	3210am	5070am	5935am	7435am
0400-0500	USA, WRNO New Orleans LA	7395am				0500-0500	USA, WYFR Okeechobee FL	5985na	9985af	11580eu	
0400-0500	USA, WWCR Nashville TN	3210am	5070am	5935am	7435am	0500-0530	Vatican State, Vatican R	9660af	11625af	15570af	
0400-0500	USA, WYFR Okeechobee FL	6065na	9505na	9985eu		0500-0520	Vatican State, Vatican R	4005eu	5882eu	7250eu	
0400-0430	Vietnam, Voice of	12020na	15010na			0500-0600	Zambia, Christian Voice	3330af	6065af		
0400-0500	Zambia, Christian Voice	3330af	6065af			0500-0530 vl	Zambia, R Zambia/ZNBC 1	4910do			
0400-0500 vl	Zambia, R Zambia/ZNBC 1	4910do				0500-0600 vl	Zambia, R Zambia/ZNBC 2	6165do			
0400-0500 vl	Zambia, R Zambia/ZNBC 2	6165do				0500-0530 vl	Zimbabwe, Zimbabwe BC	3396do			
0400-0500 vl	Zimbabwe, Zimbabwe BC	3396do				0505-0600	Swaziland, Trans World R	3200af	4775af	9500af	
0415-0500 vl	Malawi, MBC	5993do				0525-0500	Ghana, Ghana Broadc Corp	3366do	4915do		
0425-0440 vl	Italy, RAI Intl	5975eu	7270eu			0530-0559	Austria, R Austria Intl	6205na			
0425-0500	Nigeria, FRCN/Radio	3326do	4770do	4990do		0530-0500 vl	Italy, IRRS	3985va			
0430-0459	Austria, R Austria Intl	6155eu	13730eu			0530-0556	Romania, R Romania Intl	11790af	11940af	15250af	15270af
0430-0500 m-f/vl	Lesotho, Radio Lesotho	4800do						15340as	17720as	17790af	
0430-0455	Moldova, R Moldova Intl	7520na				0530-0600	Thailand, Radio	9655eu	11905eu	15115eu	
0430-0500	Netherlands, Radio	6165na	9590na			0530-0600 vl	Zambia, R Zambia/ZNBC 1	7220do			
0430-0500	Serbia, R Yugoslavia	9580na	11870na			0530-0600 vl	Zimbabwe, Zimbabwe BC	5975do			
0430-0500	Swaziland, Trans World R	3200af	4775af	6100af		0600-0700	Anguilla, Caribbean Beacon	6090am			
0430-0500	Switzerland, Swiss R Intl	9905ca				0600-0700	Australia, Radio	9660pa	11830as	12080pa	13605as
0430-0500	United Kingdom, BBC WS	15420af						15240pa	15415as	15510as	17750as
0455-0500	Malaysia, Voice of	6175as	9750as	15295au				5025do			
0459-0500	New Zealand, R NZ Intl	9795pa				0600-0700 vl	Australia, VL8K Katherine	4910do			
0500-0600	Anguilla, Caribbean Beacon	6090am				0600-0533	Australia, Defense Forces R	13525as			
0500-0600	Australia, Radio	9660pa	12080pa	13605as	15240pa	0600-0700 vl	Canada, CBC N Quebec Svc	9625do			
		15510as	17795pa								
0500-0600 vl	Australia, VL8K Katherine	5025do									
0500-0600 vl	Australia, VL8T Tent Crk	4910do									
0500-0600	Australia, Defense Forces R	13525as									
0500-0600 vl	Cameroon, Radio Cameroon	4850do									
0500-0600	Canada, CFRX Toronto	6070do									
0500-0600	Canada, CFVP Calgary	6030do									
0500-0600	Canada, CHNX Halifax	6130do									
0500-0600	Canada, CKZU Vancouver	6160do									
0500-0530 mtwhf	Canada, R Canada Intl	6050eu	7295af	11835af	15430me						
0500-0600	Costa Rica, Adv World R	5030ca	6150ca	9725ca							
0500-0600 as	Costa Rica, Adv World R	7375am									
0500-0600	Costa Rica, RF Peace Intl	7385am	7585am	15050am							
0500-0600	Cuba, Radio Havana	9820na									
0500-0600	Ecuador, HCJB	9745am	21455am								
0500-0550	Germany, Deutsche Welle	5960na	6045na	6120na	6145na						
		6185na	9615na	9650na							
0500-0600	Guyana, GBC/Voice of	3290do									

"SPECTRUM" CAN BE HEARD LIVE

02:00 UTC Sundays (10:00 PM EDT Saturdays) on:

Callsign	Location	Frequency
GEI-6	Clark Belt 103 deg W	5.8 MHz Wide Audio
WWCR	Nashville, TN	5070 kHz Live
	rebroadcast 0805 Mon	7435 kHz
WCNJ	Hazlet, NJ	89.3 FM
W220AA	Sayreville, NJ	91.9 FM
WNJC	Deptford, NJ	1360 AM
WODI	Brookneal, VA	1230 AM

FREQUENCIES

0600-0700	Canada, CFRX Toronto	6070do						0700-0800	Canada, CHNX Halifax	6130do			
0600-0700	Canada, CFVP Calgary	6030do						0700-0800	Canada, CKZU Vancouver	6160do			
0600-0700	Canada, CHNX Halifax	6130do						0700-0800	Costa Rica,RF Peace Intl	7385am	7585am		
0600-0700	Canada, CKZU Vancouver	6160do						0700-0708 s	Croatia, Croatian Radio	5920eu	7165va	9830eu	13830au
0600-0700	Costa Rica,RF Peace Intl	7385am	7585am					0700-0727	Czech Rep, Radio Prague	7345eu	9505eu		
0600-0608 mtwhfa	Croatia, Croatian Radio	5920eu	7165va	9830eu				0700-0730	Ecuador, HCJB	9645pa	2145sau		
0600-0700	Cuba, Radio Havana	9820na	9830na					0700-0800 as	Eqt Guinea, R East Africa	15186af			
0600-0700	Ecuador, HCJB	9745am	2145sam					0700-0800 mtwhf	Eqt Guinea, Radio Africa	15186af			
0600-0650	Germany, Deutsche Welle	11915af	13790af	15185af	17820as			0700-0715	Ghana, Ghana Broadc Corp	3366do	4915do		
		17860af	21680af					0700-0800	Guyana, GBC/Voice of	3290do			
0600-0615	Ghana, Ghana Broadc Corp	3366do	4915do					0700-0730 vl	Italy, IRRS	3985va			
0600-0700	Guyana, GBC/Voice of	3290do						0700-0800	Japan, R Japan/NHK World	7230eu	11740as	11840as	11850pa
0600-0700 vl	Italy, IRRS	3985va								11910as	11920as	15230me	17810va
0600-0700	Japan, R Japan/NHK World	5975eu	7230eu	9835as	11740as					17815af			
		11840as	11910am	11920na	12030as			0700-0800 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
		15230na	15550va	17810as				0700-0800 vl	Kiribati, Radio	9810do			
0600-0700 vl	Kenya, Kenya Broadc Corp	4885do						0700-0800	Lebanon, Voice of Hope	9960va			
0600-0700 vl	Kiribati, Radio	9810do						0700-0715	Liberia,LCN/R Liberia Int	5100do			
0600-0700	Lebanon, Voice of Hope	9960va						0700-0800 asmtwh	Malaysia, Radio	7295do			
0600-0700	Liberia,LCN/R Liberia Int	5100do						0700-0800	Malaysia, Voice of	6175as	9750as	15295au	
0600-0700	Malaysia, Voice of	6175as	9750as	15295au				0700-0800	Monaco, Trans World Radio	9755eu			
0600-0700	New Zealand, R NZ Intl	9795pa						0700-0758 as	New Zealand, R NZ Intl	9795pa			
0600-0630	Nigeria, FRCN/Radio	3326do	4770do	4990do				0700-0800 mtwhf	New Zealand, R NZ Intl	9795pa			
0600-0700	Nigeria, Voice of	7255af						0700-0757	North Korea, R Pyongyang	15340af	17765me		
0600-0657	North Korea, R Pyongyang	15180as	15230as					0700-0730 s	Norway, Radio Norway Intl	15245me			
0600-0630 s	Norway, Radio Norway Intl	7180eu	7295pa	9590af	13805af			0700-0800 vl	Papua New Guinea, NBC	9675do			
0600-0700 vl	Papua New Guinea, NBC	9675do						0700-0745	Romania, R Romania Intl	15370pa	17720pa	17790pa	17805pa
0600-0700	Russia,Voice of Russia WS	12000au	12010as	12040as	12050as			0700-0715 s	Romania, R Romania Intl	15370pa	17720pa	17790pa	17805pa
		12070as	13645pa	13665pa	15470pa			0700-0800	Russia,Voice of Russia WS	15470as	15560au	15580as	17570au
		15490pa	15560au	15580as	15595na					17580as	17610au	17795as	
		17570au	17580as	17610as	17795as			0700-0710	Sierra Leone, SLBS	3316do			
0600-0630	S Africa, Channel Africa	11900af						0700-0730	Slovakia, AWR Europe	9440eu			
0600-0630	S Africa, Trans World R	11730af						0700-0800 vl	Solomon Islands, SIBC	5020do			
0600-0610	Sierra Leone, SLBS	3316do						0700-0800	Swaziland, Trans World R	9650af			
0600-0630	Slovakia, AWR Europe	11640af						0700-0800	Taiwan, VO Free China	5950na			
0600-0630 vl	Solomon Islands, SIBC	5020do						0700-0800	United Kingdom, BBC WS	5975na	6190af	7145as	7325eu
0600-0700	Swaziland, Trans World R	4775af	6100af	9650af						9410eu	9600af	9610af	9740as
0600-0630	Swaziland, Trans World R	11730af								11760as	11835af	11940af	11955as
0600-0630	Switzerland, Swiss R Intl	9885af	11860af	13635af						12095va	15310as	15360as	15485af
0600-0700	United Kingdom, BBC WS	5975am	6005af	6175am	6180eu					15575va	17640af	17760af	17785as
		6190af	6195eu	7145as	7160af			0700-0800 as	United Kingdom, BBC WS	17885af			
		7325va	9410va	9600af	9740as			0700-0715	United Kingdom, BBC WS	6005af	7160af		
		11760as	11780eu	11940af	12095eu			0700-0730	United Kingdom, BBC WS	6180eu	6195eu	7325af	9410eu
		15310as	15360as	15420af	15565va					11780eu			
		15575va	17640af	17785as	17885af			0700-0800	USA, KAIJ Dallas TX	5810am			
		21660as						0700-0800	USA, KLTN Salt Lk City UT	7510am			
0600-0700	USA, KAIJ Dallas TX	5810am						0700-0800	USA, KWHR Naalehu HI	17780as			
0600-0700	USA, KLTN Salt Lk City UT	7510am						0700-0800	USA, WEWN Birmingham AL	5825eu			
0600-0700	USA, KVOH Los Angeles CA	9975am						0700-0800	USA, WHRI Noblesville IN	5745am			
0600-0700	USA, KWHR Naalehu HI	17780as						0700-0800	USA, WJCR Upton KY	7490na			
0600-0630	USA, Voice of America	5970af	5995af	6035af	6080af			0700-0800	USA, WMLK Bethel PA	9465eu			
		7170va	7195af	9630af	9680eu			0700-0800 smtwhf	USA, WMLK Bethel PA	9465eu			
		11805af	11950af	11965me	12080af			0700-0800	USA, WRMI/R Miami Intl	9955am			
		15205va						0700-0800	USA, WRNO New Orleans LA	7355am			
0600-0700	USA, WEWN Birmingham AL	5825eu						0700-0800	USA, WWCN Nashville TN	2390am	3210am	5070am	5935am
0600-0700	USA, WHRI Noblesville IN	5745am	7315am					0700-0800	USA, WYFR Okeechobee FL	7355eu	9985eu	13695af	
0600-0700	USA, WJCR Upton KY	7490na						0700-0800 vl	Vanuatu, Radio	3945do	4960do		
0600-0700 smtwhf	USA, WMLK Bethel PA	9465eu						0700-0800	Zambia, Christian Voice	6065af			
0600-0700	USA, WRMI/R Miami Intl	9955am						0700-0800 vl	Zambia, R Zambia/ZNBC 1	7220do			
0600-0700	USA, WRNO New Orleans LA	7355am						0700-0800 vl	Zimbabwe, Zimbabwe BC	5975do			
0600-0700	USA, WWCN Nashville TN	2390am	3210am	5070am	5935am			0730-0755	Austria, R Austria Intl	6155eu	13730eu	15410me	17870me
0600-0700	USA, WYFR Okeechobee FL	5985am	7355eu	9985eu				0730-0800	Ecuador, HCJB	9645pa	9765eu	2145sau	
0600-0700 vl	Vanuatu, Radio	3945do	4960do					0730-0745 s	Greece, Voice of	7430eu	7450eu	9425au	9775au
0600-0645 vl/m-f	Vatican State, Vatican R	5882va	7250va	9645va	11740va					11645eu			
		15595va						0730-0735	India, All India Radio	15185do	15260do		
0600-0630	Vietnam, Voice of	5925as	10060as					0730-0800 vl	Italy, IRRS	7125va			
0600-0700	Yemen, Radio Aden	9780do						0730-0800	Netherlands, Radio	9720pa	9820pa		
0600-0700	Zambia, Christian Voice	3330af	6065af					0730-0800 as	Palau, KHBN/Voice of Hope	9730as			
0600-0700 vl	Zambia, R Zambia/ZNBC 1	7220do						0730-0800	United Kingdom, BBC WS	15400va	15565va		
0600-0700 vl	Zimbabwe, Zimbabwe BC	5975do						0735-0800 as	Swaziland, Trans World R	4775af	9500af	9650af	
0615-0630	Switzerland, Swiss R Intl	6165eu	9535eu					0740-0800	Guam, TWR/KTWR	15200as			
0630-0700	Belgium, R Vlaanderen Int	6035eu	9925eu	9940au				0745-0800 s	Ghana, Ghana Broadc Corp	3366do	4915do		
0630-0700	Georgia, Radio	11805eu						0745-0755	Greece, Voice of	7430eu	7450eu	9425au	9775au
0630-0645 s	Swaziland, Trans World R	11730af								11645eu			
0630-0658	Vatican State, Vatican R	11625af	13765af	15570af				0800-0900	Anguilla,Caribbean Beacon	6090am			
0631-0640	Romania, R Romania Intl	9550eu	9665eu	11810eu	15365eu			0800-0900	Australia, Radio	5995pa	9580pa	9710pa	11640pa
0645-0700 as	Monaco, Trans World Radio	9755eu								12080pa	15365pa		
0645-0700	Romania, R Romania Intl	11740pa	11840pa	15250pa	15270pa			0800-0830	Australia, Radio	11830as	15415as	17750pa	
		17720pa						0800-0830 vl	Australia, VL8K Katherine	5025do			
0655-0700 mtwhf	Monaco, Trans World Radio	9755eu						0800-0830 vl	Australia, VL8T Tent Crk	4910do			
0700-0800	Anguilla,Caribbean Beacon	6090am						0800-0900 mtwhfa	Bhutan, Bhutan BC Service	5030do			
0700-0800	Australia, Radio	9660pa	11830as	12080pa	13605as			0800-0900 vl	Canada, CBC N Quebec Svc	9625do			
		15240pa	15415as	15510as	17750as			0800-0900	Canada, CFRX Toronto	6070do			
								0800-0900	Canada, CFVP Calgary	6030do			
0700-0800 vl	Australia, VL8K Katherine	5025do						0800-0900	Canada, CHNX Halifax	6130do			
0700-0800 vl	Australia, VL8T Tent Crk	4910do						0800-0900	Canada, CKZU Vancouver	6160do			
0700-0800	Canada, CFRX Toronto	6070do						0800-0900	Costa Rica,RF Peace Intl	7385am	7585am		
0700-0800	Canada, CFVP Calgary	6030do											

FREQUENCIES

0800-0808 mtwhf	Croatia, Croatian Radio	5920eu	7165eu	9830eu	13830au				15410af	17715au	17800af	21600af
0800-0900	Ecuador, HCJB	9645pa	9765eu	21455au				21680au				
0800-0900 as	Eqt Guinea, R East Africa	15186af				0900-0915 mtwtf	Ghana, Ghana Broadc Corp	3366do	4915do			
0800-0900 mtwhf	Eqt Guinea, Radio Africa	15186af				0900-0955	Guam, TWR/KTWR	11835as				
0800-0830	Finland, YLE/R Finland	13645as	15235au			0900-1000	Guyana, GBC/Voice of	3290do				
0800-0805 s	Ghana, Ghana Broadc Corp	3366do				0900-0930 vl	Italy, IRRS	7125va				
0800-0900	Guam, TWR/KTWR	15200as				0900-0920 tfa	Kazakhstan, Radio Almaty	9620eu	11720eu			
0800-0900	Guyana, GBC/Voice of	3290do				0900-0930 vl	Kiribati, Radio	9810do				
0800-0900	Indonesia, Voice of	9525as				0900-1000	Lebanon, Voice of Hope	9960va				
0800-0900 vl	Italy, IRRS	7125va				0900-0915	Liberia,LCN/R Liberia Int	5100do				
0800-0900 vl	Kiribati, Radio	9810do				0900-1000	Malaysia, Radio	7295do				
0800-0900	Lebanon, Voice of Hope	9960va				0900-0930	Mongolia, Voice of	15170as				
0800-0900	Liberia,LCN/R Liberia Int	5100do				0900-0925	Netherlands, Radio	9720pa	9820au	13700pa		
0800-0900	Malaysia, Radio	7295do				0900-1000	New Zealand, R NZ Intl	6100pa				
0800-0825	Malaysia, Voice of	6175as	9750as	15295au		0900-0930 s	Norway, Radio Norway Intl	13800as	15625au			
0800-0835 a	Monaco, Trans World Radio	9755eu				0900-1000 as	Palau, KHBN/Voice of Hope	9730as				
0800-0850 s	Monaco, Trans World Radio	9755eu				0900-1000 vl	Papua New Guinea, NBC	4890do				
0800-0820 mtwhf	Monaco, Trans World Radio	9755eu				0900-1000	Russia,Voice of Russia WS	7390as	9810as	11800as	11880as	
0800-0900	Netherlands, Radio	9720pa	9820pa					17610as	17795as			
0800-0816 mtwhf	New Zealand, R NZ Intl	9795pa				0900-1000 s	Slovakia, AWR Europe	9450eu				
0800-0857	North Korea, R Pyongyang	15180as	15230as			0900-0930	Switzerland, Swiss R Intl	9885au	13685au	17515au		
0800-0830 s	Norway, Radio Norway Intl	15625as				0900-1000	United Kingdom, BBC WS	5965as	6190af	6195as	9410eu	
0800-0804	Pakistan, Radio	7110as	15465eu	17865eu				9740as	11750as	11765va	11940af	
0800-0900 as	Palau, KHBN/Voice of Hope	9730as						11945as	12095eu	15190sa	15360as	
0800-0900 vl	Papua New Guinea, NBC	9675do						15400af	15485va	15565as	15575va	
0800-0900	Russia,Voice of Russia WS	9810au	11800au	15470as	15490as			17640va	17705eu	17830af	21660as	
		15560au	17610as	17795as		0900-0915	United Kingdom, BBC WS	7325eu	15310as	15360pa	17785as	
0800-0900 f	Seychelles, FEBA Radio	15540as				0900-0945	United Kingdom, BBC WS	9580as	11760as	11955as	15280as	
0800-0810	Sierra Leone, SLBS	3316do				0900-1000	USA, KAIJ Dallas TX	5810am				
0800-0900 vl	Solomon Islands, SIBC	5020do				0900-1000	USA, KTNB Salt Lk City UT	7510am				
0800-0900	South Korea, R Korea Intl	9570au	13670eu			0900-1000	USA, KWHR Naalehu HI	9930as				
0800-0805 as	Swaziland, Trans World R	4775af	9500af	9650af		0900-1000	USA, Monitor Radio Intl	7395sa	7535eu	9385au	15665as	
0800-0900	United Kingdom, BBC WS	6190af	7325eu	9410eu	9740as	0900-1000	USA, WEWN Birmingham AL	5825eu	7425na			
		11750as	11760as	11940af	11955as	0900-1000	USA, WGTG McCaysville GA	9400am				
		12095eu	15310as	15360va	15400af	0900-1000	USA, WHRI Noblesville IN	5745am	7315am			
		15485va	15575va	17640va	17760as	0900-1000	USA, WJCR Upton KY	7490na				
		17785as	17830af	21660as		0900-1000 as	USA, WRMI/R Miami Intl	9955am				
0800-0900 as	United Kingdom, BBC WS	15565va	17885af			0900-1000	USA, WRNO New Orleans LA	7355am				
0800-0815	United Kingdom, BBC WS	7145pa	11835af			0900-1000	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am	
0800-0900	USA, KAIJ Dallas TX	5810am				0900-1000	Zambia, Christian Voice	6065af				
0800-0900	USA, KNLS Anchor Point AK	9615as				0900-1000 vl	Zambia, R Zambia/ZNBC 1	7220do				
0800-0900	USA, KTNB Salt Lk City UT	7510am				0900-1000 vl	Zimbabwe, Zimbabwe BC	5975do				
0800-0900	USA, KWHR Naalehu HI	9930as				0915-1000	Ghana, Ghana Broadc Corp	6130do	7295do			
0800-0900	USA, Monitor Radio Intl	7535eu	9845au	15665eu		0920-0940 w	Kazakhstan, Radio Almaty	9620eu	11720eu			
0800-0900	USA, WEWN Birmingham AL	5825eu	7425na			0930-0955 mtwhfa	Austria, R Austria Intl	15455au	17870au			
0800-0900	USA, WHRI Noblesville IN	5745am	7315am			0930-1000	Canada, CKZN St John's	6160do				
0800-0900	USA, WJCR Upton KY	7490na				0930-1000	Georgia, Radio	11910me				
0800-0900	USA, WRMI/R Miami Intl	9955am				0930-1000	Netherlands, Radio	12065af	13710pa			
0800-0900	USA, WRNO New Orleans LA	7355am				0930-1000	Philippines, FEBC/R Intl	11635as				
0800-0900	USA, WWCR Nashville TN	2390am	3210am	5070am	5935am	1000-1100	Anguilla,Caribbean Beacon	6090am				
0800-0900	Zambia, Christian Voice	6065af				1000-1100	Australia, Radio	9580pa				
0800-0900 vl	Zambia, R Zambia/ZNBC 1	7220do				1000-1100 vl	Australia, VL8A Alice Spg	2310do				
0800-0900 vl	Zimbabwe, Zimbabwe BC	5975do				1000-1100 vl	Australia, VL8K Katherine	2485do				
0804-0850	Pakistan, Radio	15465eu	17865eu			1000-1100 vl	Australia, VL8T Tent Crk	2325do				
0815-0900 mtwtf	Nigeria, FRCN/Radio	3326do	4770do	4990do		1000-1100 vl	Canada, CBC N Quebec Svc	9625do				
0817-0900	New Zealand, R NZ Intl	6100pa				1000-1100	Canada, CFRX Toronto	6070do				
0820-0900 vl	Chile, R Esperanza	6089am				1000-1100	Canada, CFVP Calgary	6030do				
0830-0900 s	Armenia, Voice of	15270eu				1000-1100	Canada, CHNX Halifax	6130do				
0830-0900 vl	Australia, VL8A Alice Spg	2310do				1000-1100	Canada, CKZN St John's	6160do				
0830-0900 vl	Australia, VL8K Katherine	2485do				1000-1100	Canada, CKZU Vancouver	6160do				
0830-0900 vl	Australia, VL8T Tent Crk	2325do				1000-1100	China, China Radio Intl	9785pa	11755pa			
0830-0900	Georgia, Radio	11910eu				1000-1100	Costa Rica,RF Peace Intl	7385am	7585am			
0830-0840	India, All India Radio	7250do	15185do	15260do		1000-1100	Ecuador, HCJB	9645pa	21455au			
0830-0900	Lithuania, Radio Vilnius	9710eu				1000-1100 as	Eqt Guinea, R East Africa	15186af				
0830-0900	Slovakia, R Slovakia Intl	11990au	15460au	17570au		1000-1100 mtwhf	Eqt Guinea, Radio Africa	15186af				
0830-0900	United Kingdom, BBC WS	15280as				1000-1100	Guam, AWR/KSDA	11790as				
0855-0900	Guam, TWR/KTWR	11830au				1000-1100	Guam, TWR/KTWR	9865as				
0900-1000	Anguilla,Caribbean Beacon	6090am				1000-1100	India, All India Radio	11585as	13700as	15050as	17387au	
0900-1000	Australia, Radio	9580pa	11640pa					17840as				
0900-1000 vl	Australia, VL8A Alice Spg	2310do				1000-1025	Israel, Kol Israel	15640eu				
0900-1000 vl	Australia, VL8K Katherine	2485do				1000-1100 vl	Italy, IRRS	7125va				
0900-1000 vl	Australia, VL8T Tent Crk	2325do				1000-1100	Jordan, Radio	11690eu				
0900-0925	Belgium, R Vlaanderen Int	6035eu	7190eu			1000-1100	Lebanon, Voice of Hope	9960va				
0900-1000	Canada, CFRX Toronto	6070do				1000-1100	Malaysia, Radio	7295do				
0900-1000	Canada, CFVP Calgary	6030do				1000-1100 vl	Malaysia, RTM Kuching	7160do				
0900-1000	Canada, CHNX Halifax	6130do				1000-1100 vl	Malaysia,RTM KotaKinabalu	5980do				
0900-1000	Canada, CKZU Vancouver	6160do				1000-1025	Netherlands, Radio	12065au	13710pa			
0900-0935 vl	Chile, R Esperanza	6089am				1000-1100	New Zealand, R NZ Intl	6100pa				
0900-1000	China, China Radio Intl	9785pa	11755pa			1000-1100	Nigeria, Voice of	7255af				
0900-1000	Costa Rica,RF Peace Intl	7385am	7585am			1000-1100 as	Palau, KHBN/Voice of Hope	9730as				
0900-0908 s	Croatia, Croatian Radio	5920eu	7165va	9830eu	13830au	1000-1100 vl	Papua New Guinea, NBC	4890do				
0900-0927	Czech Rep, Radio Prague	15640me	17485af			1000-1100	Philippines, FEBC/R Intl	11635as				
0900-1000	Ecuador, HCJB	9645pa	21455au			1000-1100	Russia,Voice of Russia WS	7330as	7390as	9810au	9835au	
0900-0930	Ecuador, HCJB	9645pa	9765eu					11655as	11800au	11880as	15170as	
0900-1000 as	Eqt Guinea, R East Africa	15186af						15435as	15490as	15510as	17560as	
0900-1000 mtwhf	Eqt Guinea, Radio Africa	15186af						17610as	17775as	17795as		
0900-0950	Germany, Deutsche Welle	6160au	9565af	12025af	12055as	1000-1100 vl	Solomon Islands, SIBC	5020do				

FREQUENCIES

1000-1030	Switzerland, Swiss R Intl	6165eu	9535eu			1100-1200	USA, KAIJ Dallas TX	5810am			
1000-1100	United Kingdom, BBC WS	5965va	6190af	6195am	9410eu	1100-1200	USA, KTBN Salt Lk City UT	7510am			
		9740as	11750as	11760as	11765va	1100-1200	USA, KWHR Naalehu HI	9930as			
		11940af	12095eu	15310as	15485va	1100-1200	USA, Monitor Radio Intl	6095na	7395sa	9355eu	9385au
		15565as	15575me	17640af	17705af			9430au			
		17885va	21660as			1100-1200	USA, Voice of America	5985pa	6160as	9645as	9760as
1000-1100 as	United Kingdom, BBC WS	15190am	15400am	17830af				11720as	15160as	15425as	
1000-1030	United Kingdom, BBC WS	15360as				1100-1200	USA, WEWN Birmingham AL	7425eu			
1000-1100	USA, KAIJ Dallas TX	5810am				1100-1200	USA, WHRI Noblesville IN	6040am	9495am		
1000-1100	USA, KTBN Salt Lk City UT	7510am				1100-1200	USA, WJCR Upton KY	7490na			
1000-1100	USA, KWHR Naalehu HI	9930as				1100-1200	USA, WRMI/R Miami Intl	9955am			
1000-1100	USA, Monitor Radio Intl	6095na	7395sa	15665as	15725as	1100-1200	USA, WRNO New Orleans LA	7355am			
1000-1100	USA, Voice of America	5985pa	6165am	7405am	9590am	1100-1200	USA, WWCN Nashville TN	2390am	5070am	5935am	15685am
		11720as	15425as			1100-1200	USA, WYFR Okeechobee FL	5950na	1830na		
1000-1100	USA, WEWN Birmingham AL	7425na				1100-1130	Vietnam, Voice of	7285as	9730as		
1000-1100	USA, WGTG McCaysville GA	9400am				1100-1200	Zambia, Christian Voice	6065af			
1000-1100	USA, WHRI Noblesville IN	6040am	9495am			1100-1200 vl	Zambia, R Zambia/ZNBC 1	7220do			
1000-1100	USA, WJCR Upton KY	7490na				1120-1140	Australia, Defense Forces R	4763as			
1000-1100	USA, WRMI/R Miami Intl	9955am				1130-1200 vl	China, China Radio Intl	6995as	8660as	11445as	11700as
1000-1100	USA, WRNO New Orleans LA	7355am				1130-1200	Iran, VOIRI	9555as	11830as	11875as	15260as
1000-1100	USA, WWCN Nashville TN	2390am	5070am	5935am	15685am	1130-1140	Lesotho, Radio Lesotho	4800do			
1000-1100	USA, WYFR Okeechobee FL	5950na				1130-1200	Myanmar, Voice of	5990do			
1000-1030 vl/m-f	Vatican State, Vatican R	5882eu	9645eu	11740eu	15595eu	1130-1200	Netherlands, Radio	6045eu	9860eu		
		17550eu				1130-1200	Sweden, Radio	11650na	15240na		
1000-1030	Vietnam, Voice of	5940as	7270as	7400as	9840as	1130-1200	United Kingdom, BBC WS	6195am	17705va		
		12020as	15010as			1130-1200 f	Vatican State, Vatican R	15595as	17550au		
1000-1100	Zambia, Christian Voice	6065af				1135-1140	India, All India Radio	9595do	11620do	11710do	15185do
1000-1100 vl	Zambia, R Zambia/ZNBC 1	7220do				1200-1300	Anguilla, Caribbean Beacon	11775am			
1030-1055 s	Austria, R Austria Intl	15455au	17870au			1200-1300	Australia, Radio	5995as	6080as	9580pa	11800pa
1030-1057	Czech Rep, Radio Prague	7345eu	9505eu			1200-1300 s	Australia, Radio	9415va	11660as		
1030-1100 mtwhf	Ethiopia, Radio	5990do	7110do	9705do		1200-1300 vl	Australia, VL8A Alice Spg	2310do			
1030-1100	Guam, AWR/KSDA	15170as				1200-1300 vl	Australia, VL8K Katherine	2485do			
1030-1100	Netherlands, Radio	6045eu	9860eu	12065as	13710as	1200-1300 vl	Australia, VL8T Tent Crk	2325do			
1030-1100	South Korea, R Korea Intl	11715am				1200-1300	Brazil, Radio Bras	15445na			
1030-1100	Sri Lanka, Sri Lanka BC	11835as	17850as			1200-1230	Bulgaria, Radio	13790as			
1030-1055	UAE, Radio Dubai	13675eu	15395eu	17630eu	21605me	1200-1215	Cambodia, Natl Voice of	11940as			
1100-1200	Anguilla, Caribbean Beacon	11775am				1200-1300 vl	Canada, CBC N Quebec Svc	9625do			
1100-1200	Australia, Radio	6080as	9580pa			1200-1300	Canada, CFRX Toronto	6070do			
1100-1200 s	Australia, Radio	9415va	11660as			1200-1300	Canada, CFVP Calgary	6030do			
1100-1200 vl	Australia, VL8A Alice Spg	2310do				1200-1300	Canada, CHNX Halifax	6130do			
1100-1200 vl	Australia, VL8K Katherine	2485do				1200-1300	Canada, CKZN St John's	6160do			
1100-1200 vl	Australia, VL8T Tent Crk	2325do				1200-1300	Canada, CKZU Vancouver	6160do			
1100-1200	Canada, CFRX Toronto	6070do				1200-1230	Canada, R Canada Intl	9660as	9715me	11835me	11975me
1100-1200	Canada, CFVP Calgary	6030do						15195as			
1100-1200	Canada, CHNX Halifax	6130do				1200-1300	Canada, R Canada Intl	9640am	11855am	13650am	
1100-1200	Canada, CKZN St John's	6160do				1200-1300	China, China Radio Intl	7385pa	9565pa	9715as	11660as
1100-1200	Canada, CKZU Vancouver	6160do						11795pa	15440as		
1100-1200	Costa Rica, Adv World R	5030am	6150am	7375am	9725am	1200-1230 vl	China, China Radio Intl	6995as	8660as	11445as	11700as
		13750am						12110as			
1100-1200	Costa Rica, RF Peace Intl	7385am	7585am			1200-1300	Costa Rica, RF Peace Intl	7385am			
1100-1200	Ecuador, HCJB	12005am	15115am	21455au		1200-1208	Croatia, Croatian Radio	5920eu	7165eu	13830na	
1100-1200 as	Eqt Guinea, R East Africa	15186af				1200-1300 vl	Cyprus, BRT International	6150do			
1100-1200	Eqt Guinea, Radio Africa	9530as				1200-1300	Ecuador, HCJB	12005am	15115am	21455am	
1100-1150	Germany, Deutsche Welle	15370af	15410af	17765af	17800af	1200-1300 as	Eqt Guinea, R East Africa	15186af			
1100-1200 vl	Italy, IRRS	7125va				1200-1300	Eqt Guinea, Radio Africa	9530as			
1100-1200	Japan, R Japan/NHK World	6120na	7125na	11815as		1200-1257	France, Radio France Intl	9805af	11600as	13625eu	15155eu
1100-1200	Jordan, Radio	11690eu						15195eu	15540af	17575af	
1100-1200	Lebanon, Voice of Hope	9960va				1200-1230 s	Germany, Universal Life	9710eu			
1100-1110	Liberia, LCN/R Liberia Int	5100do				1200-1230	Iran, VOIRI	9555as	11830as	11875as	15260as
1100-1200	Malaysia, Radio	7295do				1200-1300 vl	Italy, IRRS	7125va			
1100-1200 vl	Malaysia, RTM Kuching	7160do				1200-1300	Japan, R Japan/NHK World	7125as			
1100-1200 vl	Malaysia, RTM Kota Kinabalu	5980do				1200-1300	Jordan, Radio	11690eu			
1100-1129	Mozambique, Radio	11812do				1200-1300	Lebanon, Voice of Hope	9960va			
1100-1125	Netherlands, Radio	12065as	13710as			1200-1300	Malaysia, Radio	7295do			
1100-1200	New Zealand, R NZ Intl	6100pa				1200-1300 vl	Malaysia, RTM Kota Kinabalu	5980do			
1100-1157	North Korea, R Pyongyang	3560na	6575na	9640na	9975na	1200-1250	Myanmar, Voice of	5990do			
		11335na	13650na	15230na		1200-1300	Netherlands, Radio	6045eu	9860eu		
		15520eu	17865eu								
1100-1120	Pakistan, Radio	7110va									
1100-1130 as	Palau, KHBN/Voice of Hope	9730as									
1100-1200 vl	Papua New Guinea, NBC	4890do									
1100-1200	Russia, Voice of Russia WS	4740as	7330as	11655as	11880as						
		15170as	15460as	15490as	15500as						
		15510as	17560as	17610as	17755as						
		17775as	17795as								
		6155as									
1100-1200	Singapore, R Singapore Int	6015as									
1100-1130	Solomon Islands, SIBC	5020do									
1100-1130	Sri Lanka, Sri Lanka BC	11835as	17850as								
1100-1130	Switzerland, Swiss R Intl	13635as	15415as	17515as							
1100-1200	Taiwan, Voice of Asia	7445as									
1100-1200	United Kingdom, BBC WS	5965am	6190af	6195va	9410eu						
		9580as	11750as	11760as	11940af						
		11955as	12095eu	15220am	15310as						
		15485va	15565as	15575va	17640na						
		17705eu	17830af	17885af	21660af						
1100-1130 as	United Kingdom, BBC WS	15190am									
1100-1130	United Kingdom, BBC WS	9700as	11765va	15310as	17785as						
1100-1145	United Kingdom, BBC WS	15400af	17790as								

HAUSER'S HIGHLIGHTS MONGOLIA: VOICE OF MONGOLIA

English schedule:

0900-0930 15170

1240-1310 12085

1500-1530 9720, 12085

1930-2000 9720, 12015

(Hans van den Boogert, Taiwan, *hard-core-dx*)

Sked by E-mail agrees except 1230-1300, and 12085 not 12015 at 1930 along with 9270, typo? (Andy Sennitt, *WRTH* via DSWCI DX Window)
12085 had open carrier until 1516, then English (Gatzke, *ibid.*)

FREQUENCIES

1200-1206	New Zealand, R NZ Intl	6100pa				1300-1310	Mongolia, Voice of	12085as			
1200-1230 s	Norway, Radio Norway Intl	9590eu	13800as	13805na	15605au	1300-1400 occsnal	New Zealand, R NZ Intl	6100pa			
1200-1300 vl	Papua New Guinea, NBC	4890do				1300-1357	North Korea, R Pyongyang	9345eu	9640eu	11740as	15230as
1200-1255	Poland, Polish R Warsaw	6095eu	7145eu	7270eu	9525eu	1300-1400 vl	Papua New Guinea, NBC	4890do			
		11815eu				1300-1400	Philippines, FEBC/R Intl	11995as			
1200-1300	Russia, Voice of Russia WS	4740as	4975as	7330as	11655as	1300-1356	Romania, R Romania Intl	9690eu	11885eu	15365eu	17720eu
		11785as	11880as	15110as	15170as	1300-1400	Russia, Voice of Russia WS	7330as	11700as	15430as	15460as
		15230as	15430as	15435as	15490as			15550as	17610as	17795as	
		15510as	17610as	17755as	17775as	1300-1400	Singapore, R Singapore Int	6015as	6155as		
		17795as				1300-1400 mtwhf	Sri Lanka, Sri Lanka BC	9730as			
1200-1300	Singapore, R Singapore Int	6015as	6155as			1300-1330	Switzerland, Swiss R Intl	7230as	7480as	13635as	15120as
1200-1300	South Korea, R Korea Intl	7285af						15415as	17515as		
1200-1300	Switzerland, Swiss R Intl	6165eu	9535eu			1300-1330	Turkey, Voice of	13695eu	13750va	15290as	
1200-1300	Taiwan, VO Free China	7130au	9610as			1300-1400	United Kingdom, BBC WS	5990as	6190af	6195va	9410eu
1200-1300	Ukraine, R Ukraine Intl	6020na	7150eu	12045na	12050na			9515am	9740va	11750as	11760as
1200-1300	United Kingdom, BBC WS	6190af	6195va	9410eu	9515am			11865am	11940af	12095eu	15220am
		9580as	9740as	11750as	11760as			15310as	15420af	15485va	15565as
		11940af	11955as	15220am	15310as			15575va	17640va	17705af	17830af
		15485va	15565va	15575va	17640va			17885af	21470af	21660af	
		17705af	17830af	17885af	21660af	1300-1400	USA, KAIJ Dallas TX	13815am			
1200-1300	USA, KAIJ Dallas TX	5810am				1300-1400	USA, KNLS Anchor Point AK	7365as			
1200-1300	USA, KTN Salt Lk City UT	7510am				1300-1400	USA, KTN Salt Lk City UT	7510am			
1200-1300	USA, KWHR Naalehu HI	9930as				1300-1400	USA, KWHR Naalehu HI	9930as			
1200-1300	USA, Monitor Radio Intl	6095na	9355as	9385au	9455sa	1300-1400	USA, Monitor Radio Intl	6095na	9355as	9430as	9455am
1200-1230	USA, Voice of America	6160as	9645as	9760as	11715as	1300-1330	USA, Voice of America	6160as	9645as	9760as	11715as
		15160as	15425as					15160as	15425as		
1200-1300	USA, WEWN Birmingham AL	7425na				1300-1400	USA, WEWN Birmingham AL	7425na			
1200-1300	USA, WGTG McCaysville GA	9400am				1300-1400	USA, WGTG McCaysville GA	9400am			
1200-1300	USA, WHRI Noblesville IN	6040am	9495am			1300-1400	USA, WHRI Noblesville IN	6040am	15105am		
1200-1300	USA, WJCR Upton KY	7490na				1300-1400	USA, WJCR Upton KY	7490na			
1200-1300	USA, WRMI/R Miami Intl	9955am				1300-1400	USA, WRMI/R Miami Intl	9955am			
1200-1300	USA, WRNO New Orleans LA	7355am				1300-1400	USA, WRNO New Orleans LA	7355am			
1200-1300	USA, WWCR Nashville TN	5070am	12160am	13845am	15685am	1300-1400	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1200-1300	USA, WYFR Okeechobee FL	5950na	6015na	11830na	17750na	1300-1400	USA, WYFR Okeechobee FL	5950na	11830na	13695na	17750na
1200-1230	Uzbekistan, R Tashkent	7190as	7285as	9715as	15295as	1300-1400	Zambia, Christian Voice	6065af			
1200-1300	Zambia, Christian Voice	6065af				1300-1400 vl	Zambia, R Zambia/ZNBC 1	7220do			
1200-1300 vl	Zambia, R Zambia/ZNBC 1	7220do				1302-1400	USA, WYFR Okeechobee FL	11550as			
1207-1300 occsnal	New Zealand, R NZ Intl	6100pa				1330-1400	Canada, R Canada Intl	9535as	11795as	11935eu	15325me
1215-1300	Egypt, Radio Cairo	17595as						17820af			
1215-1300	United Kingdom, BBC WS	15220am				1330-1400	China, Heilongjiang PBS	4840do			
1230-1255	Austria, R Austria Intl	6155eu	13730na			1330-1400	Guam, AWR/KSDA	9650as			
1230-1300	Bangladesh, Bangla Betar	7185as	9550as			1330-1400	India, All India Radio	9545as	11620as	13710as	
1230-1255 s	Belgium, R Vlaanderen Int	13785na	15535as			1330-1400 vl/fas	Italy, IRRS	3985va			
1230-1300 mtwhf	Finland, YLE/R Finland	11900na	15400na			1330-1400	Netherlands, Radio	9890as	12090as	15585as	
1230-1300	Guam, AWR/KSDA	13720as				1330-1400 vl	Pakistan, Radio	9485af	11565af	15595me	
1230-1235	India, All India Radio	4860do	6150do	17860do		1330-1400 mtwhf	Portugal, R Portugal Intl	21515as			
1230-1300 w	Indonesia, RRI Sorong	4875do				1330-1400	Sweden, Radio	11650na	13740pa	15240na	
1230-1300	Mongolia, Voice of	12085as				1330-1355	UAE, Radio Dubai	15395eu	17630eu	21605me	
1230-1300	Romania, R Romania Intl	9690eu	11885eu	15365eu	17720eu	1330-1400	Uzbekistan, R Tashkent	7190as	7285as	9715as	15295as
1230-1300	South Korea, R Korea Intl	9570as	9640as	13670as		1330-1400	Vietnam, Voice of	5940eu	7270eu	7400eu	9840as
1230-1300 mtwhf	Sri Lanka, Sri Lanka BC	9730as						12020eu	15010as		
1230-1300	Sweden, Radio	13740as	15240pa			1335-1345	Greece, Voice of	9375eu	9590na	15175na	15630na
1230-1300	Thailand, Radio	9505as	9655as	9885as	11905as	1345-1400	Vatican State, Vatican R	11625as			
1230-1300	Turkey, Voice of	13750eu	15290as			1350-1400	South Korea, KBS-1	3930do			
1230-1300	Vietnam, Voice of	5940as	7270as	7400as	9840as	1355-1400	Georgia, Voice of Hope	12120as			
		12020as	15010as			1400-1500	Anguilla, Caribbean Beacon	11775am			
1240-1250	Greece, Voice of	11645af				1400-1500	Australia, Radio	5870pa	5995pa	9415va	11800pa
1300-1400	Anguilla, Caribbean Beacon	11775am				1400-1500 vl	Australia, VL8A Alice Spg	2310do			
1300-1400	Australia, Radio	5995pa	6080as	9580pa	11800pa	1400-1500 vl	Australia, VL8K Katherine	2485do			
1300-1330 s	Australia, Radio	9415va	11660as			1400-1500 vl	Australia, VIB Tent Crk	2325do			
1300-1400 vl	Australia, VL8A Alice Spg	2310do				1400-1500 vl	Canada, CBC N Quebec Svc	9625do			
1300-1400 vl	Australia, VL8K Katherine	2485do				1400-1500	Canada, CFRX Toronto	6070do			
1300-1400 vl	Australia, VIB Tent Crk	2325do				1400-1500	Canada, CFVP Calgary	6030do			
1300-1325 mtwhf	Belgium, R Vlaanderen Int	13785as	15535as			1400-1500	Canada, CHNX Halifax	6130do			
1300-1320	Brazil, Radio Bras	15445na				1400-1500	Canada, CKZN St John's	6160do			
1300-1400 vl	Canada, CBC N Quebec Svc	9625do				1400-1500	Canada, CKZU Vancouver	6160do			
1300-1400	Canada, CFRX Toronto	6070do				1400-1500 s	Canada, R Canada Intl	11855am	13650am		
1300-1400	Canada, CFVP Calgary	6030do				1400-1500	China, China Radio Intl	7160as	7405na	9535as	11825as
1300-1400	Canada, CHNX Halifax	6130do				1400-1500	Ecuador, HCJB	12005am	15115am	21455am	
1300-1400	Canada, CKZN St John's	6160do				1400-1500 as	Eq Guinea, R East Africa	15186af			
1300-1400	Canada, CKZU Vancouver	6160do									
1300-1400 mtwhf	Canada, R Canada Intl	9640am	11855am	13650am							
1300-1400 s	Canada, R Canada Intl	11855am	13650am								
1300-1400	China, China Radio Intl	6140as	7385pa	7405as	9715as						
		11660pa	11980as								
		7385am									
1300-1400	Costa Rica, RF Peace Intl	13580eu	17485af								
1300-1330	Czech Rep, Radio Prague	12005am	15115am	21455am							
1300-1400	Ecuador, HCJB	12005am	15115am	21455am							
1300-1330	Egypt, Radio Cairo	17595as									
1300-1400 as	Eq Guinea, R East Africa	15186af									
1300-1400	Eq Guinea, Radio Africa	9530as									
1300-1330 vl	Italy, IRRS	7125va									
1300-1400	Jordan, Radio	11690eu									
1300-1310	Liberia, LCN/R Liberia Int	5100do									
1300-1400	Malaysia, Radio	7295do									
1300-1400 vl	Malaysia, RTM Kuching	7160do									
1300-1400 vl	Malaysia, RTM KotaKinabalu	5980do									

MT MONITORING TEAM

Next Reporting Deadline: October 19, 1997

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FREQUENCIES

1400-1457	France, Radio France Intl	11910as	15405me	17560me	1500-1515 s	Myanmar, Voice of	5990do		
1400-1500	Georgia, Voice of Hope	12120as			1500-1525	Netherlands, Radio	9890as	12090as	15585as
1400-1500	India, All India Radio	9545as	11620as	13710as	1500-1600 occsnal	New Zealand, R NZ Intl	6100pa		
1400-1430	Israel, Kol Israel	12080na	15650na		1500-1600	Nigeria, Voice of	7255af		
1400-1500 vlfas	Italy, IRRS	3985va			1500-1557	North Korea, R Pyongyang	3560na	9325eu	9640eu 9975eu
1400-1500	Japan, R Japan/NHK World	7200eu					11335as	11735as	13650af 13785as
1400-1500	Jordan, Radio	11690eu			1500-1530 s	Norway, Radio Norway Intl	9985as	13805as	
1400-1500	Malaysia, Radio	7295do			1500-1530 as	Palau, KHBV/Voice of Hope	9985as		
1400-1500	Malaysia, RTM Kuching	7160do			1500-1600 vl	Papua New Guinea, NBC	4890do		
1400-1500 vl	Malaysia, RTM KotaKinabalu	5980do			1500-1600	Philippines, FEBC/R Intl	11995as		
1400-1430	Mexico, Radio Mexico Intl	9705na			1500-1526	Romania, R Romania Intl	15335as	17720as	
1400-1500	Netherlands, Radio	9890as	12090as	15585as	1500-1600	Russia, Voice of Russia WS	4740me	4940me	4975me 7345as
1400-1500 occsnal	New Zealand, R NZ Intl	6100pa					9440af	9595me	9675me 11775af
1400-1410	Pakistan, Radio	9485af	9645va	11565af 15595me	1500-1600 sm	Russia, Voice of Russia WS	11835me	12025af	12035af 15320me
1400-1500 vl	Papua New Guinea, NBC	4890do			1500-1600 mtwhfa	Seychelles, FEBA Radio	15430af	15460me	15540me 17525me
1400-1500	Philippines, FEBC/R Intl	11995as			1500-1530 mt fa	Seychelles, FEBA Radio	7325me	9730eu	
1400-1500	Russia, Voice of Russia WS	4740me	4940me	4975me 7345as	1500-1600	Singapore, R Corp of Sing	9810as		
		9595me	9800as	11665me 11835me	1500-1600	United Kingdom, BBC WS	11600as		
		11985me	15350me	15430me 15540me			6155do		
1400-1500	Singapore, R Corp of Sing	6155do					5975as	5990as	6190af 6195as
1400-1500	Sri Lanka, Sri Lanka BC	9730as					9410eu	9515am	9740as 11750as
1400-1430	Thailand, Radio	9655as	9830as	11905as			11865am	11940af	12095as 15220am
1400-1410 thfs	Turkmenistan, Turkmen R	5015eu					15400af	15485af	15565va 15575va
1400-1500	United Kingdom, BBC WS	5990as	6190af	6195as 9410eu			17705af	17830af	17840am 21470af
		9515am	9740as	11750as 11865am			21660af		
		11940af	12095eu	15220am 15485va	1500-1530	United Kingdom, BBC WS	11860af	15420af	17880af 21490af
		15565as	15575va	17640va 17830af	1500-1600	USA, KAIJ Dallas TX	13815am		
		17840am	21470af	21660af	1500-1600	USA, KTBN Salt Lk City UT	15590am		
1400-1500	USA, KAIJ Dallas TX	13815am			1500-1600	USA, KWHR Naalehu HI	9930as		
1400-1500	USA, KJES Mesquite NM	11715na			1500-1600	USA, Voice of America	6160as	7125as	7215as 9645as
1400-1500	USA, KTBN Salt Lk City UT	7510am					9700me	9760as	15205as 15255va
1400-1500	USA, Monitor Radio Intl	9355as					15395as		
1400-1500	USA, Voice of America	6160as	7125as	7215as 9645as	1500-1600	USA, WEWN Birmingham AL	9455na	11875na	15745eu
		9760as	15160as	15225va 15395as	1500-1600	USA, WGTG McCaysville GA	9400am		
		15425as			1500-1600	USA, WHRI Noblesville IN	13760am	15105am	
1400-1500	USA, WEWN Birmingham AL	9455na	11875na	15745eu	1500-1600	USA, WJCR Upton KY	7490na		
1400-1500	USA, WGTG McCaysville GA	9400am			1500-1600	USA, WRMI/R Miami Intl	9955am		
1400-1500	USA, WHRI Noblesville IN	6040am	15105am		1500-1600	USA, WRNO New Orleans LA	7355am		
1400-1500	USA, WJCR Upton KY	7490na			1500-1600	USA, WWCR Nashville TN	9475am	12160am	13845am 15685am
1400-1500	USA, WRMI/R Miami Intl	9955am			1500-1600	USA, WYFR Okeechobee FL	11830na	17750ca	
1400-1500	USA, WRNO New Orleans LA	7355am			1500-1600	Zambia, Christian Voice	6065af		
1400-1500	USA, WWCR Nashville TN	9475am	12150am	13845am 15685am	1500-1600 vl	Zambia, R Zambia/ZNBC 1	4910do		
1400-1500	USA, WYFR Okeechobee FL	5950na	11830na	17750ca	1500-1600 vl	Zambia, R Zambia/ZNBC 2	6165do		
1400-1405	Vatican State, Vatican R	11625as	13755au		1515-1530 mtwhf	Estonia, Radio	5925eu		
1400-1500	Zambia, Christian Voice	6065af			1530-1545	India, All India Radio	6150do	7140do	7410do 9565do
1400-1500 vl	Zambia, R Zambia/ZNBC 1	4910do					9835do	9910do	11740do
1415-1430 vl	Cyprus, BRT International	6150do			1530-1600	Iran, VOIRI	11790as	13605as	
1415-1425	Nepal, Radio	5005do	7165do		1530-1545 sm	Seychelles, FEBA Radio	11600as		
1420-1500 as	Palau, KHBV/Voice of Hope	9985as			1530-1600 mtwhf	Sri Lanka, Sri Lanka BC	9730as		
1430-1500 vl	China, China Radio Intl	6995as	8660as	9880as 11445as	1545-1600 sh	Bangladesh, Bangla Betar	4880do		
1430-1500	Guam, AWR/KSDA	7400as			1545-1554	Israel, Kol Israel	12080va	15650va	
1430-1440	India, All India Radio	6150do	9565do	9835do	1550-1600	Vatican State, Vatican R	9940as	13765as	
1430-1440 mtwhf	Indonesia, RRI Uj Pandang	4753do			1600-1700	Algeria, R Algiers Intl	15160me		
1430-1500	Romania, R Romania Intl	15335as	17720as		1600-1700	Anguilla, Caribbean Beacon	11775am		
1430-1500 vl	Zambia, R Zambia/ZNBC 2	6165do			1600-1700	Australia, Radio	5870pa	5995pa	6080pa 9415as
1440-1500	Myanmar, Voice of	5990do					9615pa	11660pa	
1500-1600	Anguilla, Caribbean Beacon	11775am			1600-1700 vl	Australia, VL8A Alice Spg	2310do		
1500-1600	Australia, Radio	5870pa	5995pa	9415as 9615as	1600-1700 vl	Australia, VL8K Katherine	2485do		
		11660as	11800pa		1600-1700 vl	Australia, VL8T Tent Crk	2325do		
1500-1600 vl	Australia, VL8A Alice Spg	2310do			1600-1610	Bangladesh, Bangla Betar	4880do	15520do	
1500-1600 vl	Australia, VL8K Katherine	2485do			1600-1700 vl	Canada, CBC N Quebec Svc	9625do		
1500-1600 vl	Australia, VL8T Tent Crk	2325do			1600-1700	Canada, CFRX Toronto	6070do		
1500-1600 vl	Canada, CBC N Quebec Svc	9625do			1600-1700	Canada, CFVP Calgary	6030do		
1500-1600	Canada, CFRX Toronto	6070do			1600-1700	Canada, CHNX Halifax	6130do		
1500-1600	Canada, CFVP Calgary	6030do			1600-1700	Canada, CKZN St John's	6160do		
1500-1600	Canada, CHNX Halifax	6130do			1600-1700	Canada, CKZU Vancouver	6160do		
1500-1600	Canada, CKZN St John's	6160do			1600-1700	China, China Radio Intl	9565as	15110af	15130af
1500-1600	Canada, CKZU Vancouver	6160do			1600-1700 as	Costa Rica, Adv World R	9725am	11870am	13750am
1500-1600 s	Canada, R Canada Intl	11855am	13650am		1600-1700	Costa Rica, RF Peace Intl	7385am	15050am	
1500-1600	China, China Radio Intl	7160as	9785as		1600-1627	Czech Rep, Radio Prague	5930eu	17485af	
1500-1600	Costa Rica, RF Peace Intl	7385am	15050am		1600-1700	Ethiopia, Radio	7165af	9560af	11800af
1500-1600	Ecuador, HCJB	12005am	15115am	21455am	1600-1654	France, Radio France Intl	11615me	11700af	12015af 15210af
1500-1600 as	Eq Guinea, R East Africa	15186af					15460af	15530af	
1500-1600	Georgia, Voice of Hope	12120as			1600-1650	Germany, Deutsche Welle	6170as	7185af	7225as 9735af
1500-1600	Guam, TWR/KTWR	11580as					9875as	11810af	13690as 17800af
1500-1600 a	Ireland, W Coast R Ireland	6175eu			1600-1630	Guam, TWR/KTWR	11580as		
1500-1525	Israel, Kol Israel	9435eu	11695as	15640ca	1600-1630	Iran, VOIRI	11790as	13605as	
1500-1600 vlfas	Italy, IRRS	3985va			1600-1700 vl	Italy, IRRS	3985va		
1500-1600	Japan, R Japan/NHK World	7200af	7240af	9535na 9750as	1600-1630	Jordan, Radio	11690eu		
		11730af	15355af		1600-1610	Lesotho, Radio Lesotho	4800do		
1500-1600	Jordan, Radio	11690eu			1600-1700	Malaysia, Radio	7295do		
1500-1510	Liberia, LCN/R Liberia Int	5100do			1600-1650 occsnal	New Zealand, R NZ Intl	6100pa		
1500-1600	Malaysia, Radio	7295do			1600-1700	Nigeria, Voice of	7255af		
1500-1600 vl	Malaysia, RTM Kuching	7160do			1600-1630	Pakistan, Radio	7230me	9485me	11565me 11935af
1500-1600 vl	Malaysia, RTM KotaKinabalu	5980do					15570af	15595me	
1500-1530	Mexico, Radio Mexico Intl	9705na			1600-1700 vl	Papua New Guinea, NBC	4890do		
1500-1530	Mongolia, Voice of	9720as	12085au		1600-1700	Russia, Voice of Russia WS	7290eu	7345as	7350eu 7440af

FREQUENCIES

11725af	9775eu	9440af	9615af	9730eu	9765eu	1700-1730	Spain, R Exterior Espana	9620eu			
12025af	11775af	9880eu	9975af	11685af		1700-1800	Swaziland, Trans World R	9500af			
17875af	15350af	11850af	11945af			1700-1730	Switzerland, Swiss R Intl	9905eu			
1600-1630		15430eu	17525me			1700-1800	United Kingdom, BBC WS	3255af	5975as	6090va	6190af
1600-1700	S Africa, Channel Africa	6120af	9685af					6195eu	7160as	9410eu	9510as
1600-1700	Singapore, R Corp of Sing	6155do						11750as	12095eu	15400af	15420af
1600-1700	South Korea, R Korea Intl	5975eu	9515af	9870af		1700-1745	United Kingdom, BBC WS	15485eu	15575va	17830af	17840af
1600-1700	Swaziland, Trans World R	9500af				1700-1800	USA, KAIJ Dallas TX	3915as	9630af	11860af	
1600-1630	Switzerland, Swiss R Intl	12075as	13635as	15530as		1700-1800	USA, KJTB Salt Lk City UT	13815am			
1600-1640	UAE, Radio Dubai	15395me	17630eu			1700-1800	USA, KWHR Naalehu HI	15590am			
1600-1700	United Kingdom, BBC WS	3255af	3915as	5975as	6190af	1700-1800	USA, Voice of America	9930as			
		7160as	7275as	9410eu	11750as			6110as	6160as	7125as	7170as
		12095eu	15400af	15485eu	15565me			9645as	9700me	9760af	15255va
		15575va	17830af	17840am	21470af			15395as	15445af	17895af	
		21660af				1700-1800 mtwhf	USA, Voice of America	5990as	6045as	7150as	9550as
1600-1615	United Kingdom, BBC WS	5990as	6195as	9515am	9740as			9770as	11870as	15135as	
1600-1700	USA, KAIJ Dallas TX	13815am				1700-1800	USA, WEWN Birmingham AL	11875na	13615na	15745eu	
1600-1700	USA, KJTB Salt Lk City UT	15590am				1700-1800	USA, WGTG McCaysville GA	9400am			
1600-1700	USA, KWHR Naalehu HI	9930as				1700-1800	USA, WHRI Noblesville IN	9495am	13760am		
1600-1700	USA, Voice of America	6035af	6110as	6160as	7125as	1700-1800	USA, WINB Red Lion PA	15715af			
		7215as	9645as	9700me	9760as	1700-1800	USA, WJCR Upton KY	7490na			
		13600af	13710af	15205va	15225af	1700-1800 smtwhf	USA, WMLK Bethel PA	9465eu			
		15255va	15395as	15410af	15445af	1700-1800	USA, WRMI/R Miami Intl	9955am			
		17895af				1700-1800	USA, WRNO New Orleans LA	7355am			
1600-1700	USA, WEWN Birmingham AL	11875na	13615na	15745eu		1700-1800	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1600-1700	USA, WGTG McCaysville GA	9400am				1700-1800	USA, WYFR Okeechobee FL	11550as	15695eu	21745eu	
1600-1700	USA, WHRI Noblesville IN	13760am	15105am			1700-1800	Zambia, Christian Voice	3330af	4965af		
1600-1700	USA, WJCR Upton KY	7490na				1700-1800 vl	Zambia, R Zambia/ZNBC 1	4910do			
1600-1700 smtwhf	USA, WMLK Bethel PA	9465eu				1700-1800 vl	Zambia, R Zambia/ZNBC 2	6165do			
1600-1700	USA, WRMI/R Miami Intl	9955am				1700-1800 vl	Zimbabwe, Zimbabwe BC	4828do			
1600-1700	USA, WRNO New Orleans LA	7355am				1730-1800 vl	Cyprus, BRT International	6150do			
1600-1700	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am	1730-1800 mtwhf	Georgia, Radio	6080eu			
1600-1700	USA, WYFR Okeechobee FL	11550as	11705na	11830na	15695eu	1730-1800	Guam, AWR/KSDA	9370as			
		17750eu	21525af	21745eu		1730-1800	Netherlands, Radio	6020af	7120af	11655af	
1600-1610	Vatican State, Vatican R	9940as	11635as			1730-1800	Philippines, R Pilipinas	11720me	11890me	15190me	
1600-1630	Vatican State, Vatican R	4005eu	5882eu	7250eu	9645eu	1730-1756	Romania, R Romania Intl	9550af	11940af	15340af	
		11810eu				1730-1800 mtwh	Swaziland, Trans World R	3200af			
1600-1630	Vietnam, Voice of	9840af	15010af			1730-1800	Sweden, Radio	6065eu	13800va		
1600-1700	Zambia, Christian Voice	3330af	4965af			1730-1800 s	Sweden, Radio	9590eu	13800va		
1600-1700 vl	Zambia, R Zambia/ZNBC 1	4910do				1730-1759	Vatican State, Vatican R	11625af	15570af	17550af	
1600-1700 vl	Zambia, R Zambia/ZNBC 2	6165do				1745-1800	Bangladesh, Bangla Betar	7190as	9570eu	15520do	
1610-1615	Bangladesh, Bangla Betar	4880do				1745-1800	India, All India Radio	7410eu	9950eu	11620af	11935af
1615-1700 as	United Kingdom, BBC WS	9515am	11860af	15420af				13780do	15075af		
1630-1655	Austria, R Austria Intl	6155eu	9655eu	11855me	13710as	1745-1800	Swaziland, Trans World R	3200af			
		13730af				1755-1800	Georgia, Voice of Hope	9310eu			
1630-1657	Canada, R Canada Intl	7150as	9550as			1800-1900	Anguilla, Caribbean Beacon	11775am			
1630-1700	Egypt, Radio Cairo	15255af				1800-1900	Australia, Radio	6080as	9415va	9615as	11880pa
1630-1700	Georgia, Radio	6180eu				1800-1900 vl	Australia, VL8A Alice Spg	2310do			
1630-1700	Slovakia, AWR Europe	11600af	13580me			1800-1900 vl	Australia, VL8K Katherine	2485do			
1630-1700	Slovakia, R Slovakia Intl	5915eu	6055eu	7345eu		1800-1900 vl	Australia, VL8T Tent Crk	2325do			
1645-1700 irreg	Afghanistan, Radio	7200as				1800-1900	Bangladesh, Bangla Betar	7190eu	9570as	15520do	
1645-1700	Tajikistan, Radio Dushanbe	7245as	9905as			1800-1825 mtwhf	Belgium, R Vlaanderen Int	5910eu	13645af		
1650-1700	Eqt Guinea, Radio Africa	15186af				1800-1900	Brazil, Radio Bras	15265eu			
1650-1700 mtwhf	New Zealand, R NZ Intl	6145pa				1800-1900	Canada, CFRX Toronto	6070do			
1700-1800	Anguilla, Caribbean Beacon	11775am				1800-1900	Canada, CFVP Calgary	6030do			
1700-1800	Australia, Radio	5870pa	6080pa	6355va	9415va	1800-1900	Canada, CHNX Halifax	6130do			
		9615as	11880pa			1800-1900	Canada, CKZN St John's	6160do			
1700-1800 vl	Australia, VL8A Alice Spg	2310do				1800-1900	Canada, CKZU Vancouver	6160do			
1700-1800 vl	Australia, VL8K Katherine	2485do				1800-1900	Costa Rica, RF Peace Intl	15050am			
1700-1800 vl	Australia, VL8T Tent Crk	2325do				1800-1808	Croatia, Croatian Radio	5895eu	7165eu	9595va	13830na
1700-1800 vl	Canada, CBC N Quebec Svc	9625do				1800-1830	Egypt, Radio Cairo	15255af			
1700-1800	Canada, CFRX Toronto	6070do				1800-1900	Eqt Guinea, Radio Africa	15186af			
1700-1800	Canada, CFVP Calgary	6030do				1800-1900	Georgia, Voice of Hope	9310eu			
1700-1800	Canada, CHNX Halifax	6130do				1800-1900	India, All India Radio	7410eu	9650eu	9950af	11620af
1700-1800	Canada, CKZN St John's	6160do						11935me	13770as	13780as	15075as
1700-1800	Canada, CKZU Vancouver	6160do				1800-1900 vl	Italy, IRRS	3985va			
1700-1800	China, China Radio Intl	5220af	7150af	7160af	7405af	1800-1900 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
		9570af	11910af			1800-1900	Kuwait, Radio	11990na			
1700-1800	Costa Rica, RF Peace Intl	15050am				1800-1900 s	Morocco, RTVM Marocaine	17815af			
1700-1727	Czech Rep, Radio Prague	5930eu	15640af			1800-1825	Netherlands, Radio	6020af	7120af	11655af	
1700-1800	Egypt, Radio Cairo	15255af				1800-1851 mtwhf	New Zealand, R NZ Intl	6145pa			
1700-1800	Eqt Guinea, Radio Africa	15186af				1800-1830 s	Norway, Radio Norway Intl	7485eu	9590me	15220af	
1700-1730	France, Radio France Intl	15210af	15460me			1800-1900 vl	Papua New Guinea, NBC	4890do			
1700-1800	Georgia, Voice of Hope	9310eu				1800-1900 vl	Philippines, R Pilipinas	11720me	11890me	15190me	
1700-1800 vl	Italy, IRRS	3985va				1800-1900	Russia, Voice of Russia WS	7290eu	7295af	7350eu	9440af
1700-1800	Japan, R Japan/NHK World	6035na	7110na	7200na	7225na			9675af	9775eu	9785af	9810eu
		9535na	9835na	11730as	11880as			9865eu	9880eu	9945eu	9975af
		6145pa						11775af	11945af	11985af	
1700-1800 mtwhf	New Zealand, R NZ Intl	6145pa				1800-1900 as	S Africa, World Music R	3345eu	6290af		
1700-1757	North Korea, R Pyongyang	9325eu	9640eu	9975af	13785me	1800-1900	Sudan, Radio Omdurman	9200af			
1700-1800 vl	Papua New Guinea, NBC	4890do				1800-1900	Swaziland, Trans World R	3200af			
1700-1755	Poland, Polish R Warsaw	6000eu	6095eu	7285eu		1800-1830	Swaziland, Trans World R	9500af			
1700-1800	Russia, Voice of Russia WS	7440af	9440af	9765eu	9775eu			3255af	6180eu	6190af	6195eu
		9865eu	9880eu	9945af	11775af			9410va	12095eu	15400af	15420af
		17875af						15485va	15575va	17830af	
1700-1730	S Africa, Channel Africa	11900af				1800-1830	United Kingdom, BBC WS	5975as	6090va	9510as	21490af
1700-1730	Slovakia, AWR Europe	15620af									

FREQUENCIES

1800-1900	USA, KAIJ Dallas TX	13815am				1900-2000	Romania, R Romania Intl	7105af	7195eu	9550eu	9690eu
1800-1900	USA, KJES Mesquite NM	15385na						11810eu	11940af		
1800-1900	USA, KTBN Salt Lk City UT	15590am				1900-2000	Russia, Voice of Russia WS	7290eu	7350eu	7440eu	9440af
1800-1900	USA, KWHR Naalehu HI	13625as						9775eu	9810eu	9865eu	9945af
1800-1900	USA, Monitor Radio Intl	9385af	13770eu	15665eu				11765af	17875af		
1800-1900	USA, Voice of America	7415af	9760af	11975af	15410af			3345eu	6290af		
		15580af	17895af			1900-2000 as	S Africa, World Music R	7230au			
1800-1900	USA, WEWN Birmingham AL	11875na	13615na	15745eu		1900-1930	Serbia, R Yugoslavia	5975eu	7275as		
1800-1900	USA, WGTG McCaysville GA	9400am				1900-2000	South Korea, R Korea Intl	3200af			
1800-1900	USA, WHRI Noblesville IN	9495am	13760eu			1900-2000	Swaziland, Trans World R	6165eu			
1800-1900	USA, WINB Red Lion PA	15715af				1900-1920	Switzerland, Swiss R Intl	7210eu	9655eu	11905eu	
1800-1900	USA, WJCR Upton KY	7490na				1900-2000	Thailand, Radio	9445eu	13695na		
1800-1900 smtwhf	USA, WMLK Bethel PA	9465eu				1900-1930	Turkey, Voice of	3255af	6005af	6180eu	6190af
1800-1900 as	USA, WRMI/R Miami Intl	9955am				1900-2000	United Kingdom, BBC WS	6195va	9410af	9630af	9740as
1800-1900	USA, WRNO New Orleans LA	7355am						11835af	12095eu	15400af	15485va
1800-1900	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am			15575va	17830af		
1800-1900	USA, WYFR Okeechobee FL	15695eu	17555eu			1900-2000	USA, KAIJ Dallas TX	13815am			
1800-1927	Vietnam, Voice of	9840eu	15010eu			1900-2000	USA, KTBN Salt Lk City UT	15590am			
1800-1900	Yemen, Radio Aden	9780do				1900-2000	USA, KWHR Naalehu HI	13625as			
1800-1900	Zambia, Christian Voice	3330af	4965af			1900-2000	USA, Monitor Radio Intl	9385af	13770eu	15665eu	17510af
1800-1900 vl	Zambia, R Zambia/ZNBC 1	4910do				1900-2000	USA, Voice of America	6035af	7325af	7415af	9525pa
1800-1900 vl	Zambia, R Zambia/ZNBC 2	6165do						9760af	11870pa	11975af	15180pa
1800-1900 vl	Zimbabwe, Zimbabwe BC	4828do						15410af	15445af		
1805-1830	Malawi, MBC	5993do				1900-1930 s	USA, Voice of America	4950af			
1825-1900 vl	Cyprus, BRT International	6150do				1900-2000	USA, WEWN Birmingham AL	11875na			
1830-1900 t	Belarus, Radiosta Belarus	6010eu	7105eu	7205eu	7210eu	1900-2000	USA, WGTG McCaysville GA	9400am			
1830-1900	Georgia, Radio	11910eu				1900-2000	USA, WHRI Noblesville IN	9495am	13760eu		
1830-1900	Netherlands, Radio	6020af	7120af	9895af	11655af	1900-2000	USA, WINB Red Lion PA	15715eu			
		15315af	17605af			1900-2000	USA, WJCR Upton KY	7490na			
1830-1900 w	Saipan, FEBC/KFBS	9465as				1900-2000 smtwhf	USA, WMLK Bethel PA	9465eu			
1830-1900 a	Serbia, R Yugoslavia	6100eu	9720af			1900-2000	USA, WRMI/R Miami Intl	9955am			
1830-1900	Slovakia, R Slovakia Intl	5915eu	6055eu	7345eu		1900-2000	USA, WRNO New Orleans LA	7355am			
1830-1835	Somalia, Radio Mogadishu	6732do				1900-2000	USA, WWCR Nashville TN	9475am	12160am	13845am	15685am
1830-1900	Turkey, Voice of	9445eu	13695na			1900-2000	USA, WYFR Okeechobee FL	17555af			
1830-1900	United Kingdom, BBC WS	6005af	9630af			1900-1927	Vietnam, Voice of	9840eu	15010eu		
1830-1900	USA, Voice of America	7170as	7330af	9860af		1900-2000	Zambia, Christian Voice	3330af	4965af		
1833-1900	Cote D' Ivoire, RDTV	11920do				1900-2000 vl	Zambia, R Zambia/ZNBC 1	4910do			
1840-1850	Greece, Voice of	11645af	11730na	15150af	17745na	1900-2000 vl	Zambia, R Zambia/ZNBC 2	6165do			
1845-1900	Albania, R Tirana Intl	7270eu	9570eu			1900-2000 vl	Zimbabwe, Zimbabwe BC	4828do			
1845-1900 mtwhf	Armenia, Voice of	4810eu	4990me			1910-1955	Germany, VO Mediterranean	12060eu			
1845-1900 irreg s	Mali, RDTV Malienne	4783do	4835do	5995do		1930-2000	Georgia, Radio	11760eu			
1852-1900 smtwh	New Zealand, R NZ Intl	9875pa				1930-2000	Iran, VOIRI	7290eu	9022eu		
1900-2000	Anguilla, Caribbean Beacon	11775am				1930-2000	Mongolia, Voice of	9720as	12015as		
1900-2000 mtwhf	Argentina, RAE	15345eu				1930-2000	Poland, Polish R Warsaw	6035eu	6095eu	7285eu	
1900-2000	Australia, Radio	6080pa	6355va	7240pa	9415va	1930-2000	Sweden, Radio	6065eu			
		9615as	11880pa			1935-1955	Italy, RAI Intl	6015eu	7230eu	9670eu	
1900-2000 vl	Australia, VL8A Alice Spg	2310do				1950-2000	Vatican State, Vatican R	4005eu	5882eu	7250eu	9645eu
1900-2000 vl	Australia, VL8K Katherine	2485do				1952-2000 fa	New Zealand, R NZ Intl	9875pa			
1900-2000 vl	Australia, VL8T Tent Crk	2325do				2000-2100	Algeria, R Algiers Intl	15160af			
1900-1920	Brazil, Radio Bras	15265eu				2000-2100	Angola, Radio Nacional	3355do	9535do		
1900-2000	Bulgaria, Radio	9700eu	11720eu			2000-2100	Anguilla, Caribbean Beacon	11775am			
1900-2000	Canada, CFRX Toronto	6070do				2000-2100	Australia, Radio	9415va	9615as	11880pa	
1900-2000	Canada, CFVP Calgary	6030do				2000-2100 vl	Australia, VL8A Alice Spg	2310do			
1900-2000	Canada, CHNX Halifax	6130do				2000-2100 vl	Australia, VL8K Katherine	2485do			
1900-2000	Canada, CKZN St John's	6160do				2000-2100 vl	Australia, VL8T Tent Crk	2325do			
1900-2000	Canada, CKZU Vancouver	6160do				2000-2100	Canada, CFRX Toronto	6070do			
1900-2000	China, China Radio Intl	6955af	9440af	11515af		2000-2100	Canada, CFVP Calgary	6030do			
1900-2000	Costa Rica, RF Peace Intl	15050am				2000-2100	Canada, CHNX Halifax	6130do			
1900-1930	Cote D' Ivoire, RDTV	11920do				2000-2100	Canada, CKZN St John's	6160do			
1900-1908	Croatia, Croatian Radio	5895eu	7165eu	9595va	11635na	2000-2100	Canada, CKZU Vancouver	6160do			
1900-2000 vl	Cyprus, BRT International	6150do				2000-2100	Canada, R Canada Intl	5995va	7235eu	11690af	13650af
1900-2000	Ecuador, HCJB	12015am	21455am					13670af	15150af	15325af	17820af
1900-2000	Eqt Guinea, Radio Africa	15186af						17870af			
1900-1930 m	Estonia, Radio	5925eu				2000-2100	China, China Radio Intl	5220eu	6350eu	7180af	9440af
1900-2000	Georgia, Voice of Hope	9310eu						9920eu	15110af		
1900-1950	Germany, Deutsche Welle	7250af	9640af	9670af	9735af	2000-2100	Costa Rica, RF Peace Intl	15050am			
		11785af	11810af	13790af		2000-2100 vl	Cyprus, BRT International	6150do			
1900-2000	Guatemala, Adv World R	5980am				2000-2027	Czech Rep, Radio Prague	5930eu	11600au		
1900-1930	Hungary, Radio Budapest	3975eu	7155eu	9755eu		2000-2100	Ecuador, HCJB	12015eu	21455am		
1900-1945	India, All India Radio	7410eu	9650eu	9950me	11620eu	2000-2100	Eqt Guinea, Radio Africa	15186af			
		11935af	13770as	13780as	15075as						
1900-2000 h	Ireland, W Coast R Ireland	15625af									
1900-1925	Israel, Kol Israel	7465na	9435na	11605va	15640au						
1900-2000 vl	Italy, IRRS	3985va									
1900-2000 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do							
1900-2000	Kuwait, Radio	11990eu									
1900-1930 as	Latvia, Radio	5935eu									
1900-1915	Liberia, LCN/R Liberia Int	5100do									
1900-2000 smtwha	Malta, VO Mediterranean	9765eu	9810am	12060me							
1900-1930	Mexico, Radio Mexico Intl	9705na									
1900-2000	Netherlands, Radio	6020af	7120af	9895af	11655af						
		15315af	17605af								
1900-2000 smtwh	New Zealand, R NZ Intl	9875pa									
1900-2000	Nigeria, Voice of	7255af									
1900-1957	North Korea, R Pyongyang	6520as	9600af	9975af							
1900-2000 vl	Papua New Guinea, NBC	4890do									
1900-1930 vl	Philippines, R Pilipinas	11720me	11890me	15190me							

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2100-2200 vl	Australia, VL8T Tent Crk	4910do			
2100-2125	Belgium, R Vlaanderen Int	5910eu			
2100-2200	Bulgaria, Radio	9700eu	11720eu		
2100-2115 vl	Cameroon, Radio Cameroon	4850do			
2100-2200 vl	Cameroon, Radio Garoua	5010do			
2100-2200 vl	Canada, CBC N Quebec Svc	9625do			
2100-2200	Canada, CFRX Toronto	6070do			
2100-2200	Canada, CFVP Calgary	6030do			
2100-2200	Canada, CHNX Halifax	6130do			
2100-2200	Canada, CKZU St John's	6160do			
2100-2200	Canada, CKZU Vancouver	6160do			
2100-2130	Canada, R Canada Intl	11690af	13650af	13670af	15150af
		15325af	17820af		
2100-2130 mtwhf	Canada, R Canada Intl	5995eu	7235eu		
2100-2130	China, China Radio Intl	3985eu	5220eu	6950eu	9920eu
		11715af	15110af		
		15050am			
2100-2200	Costa Rica, RF Peace Intl				
2100-2108	Croatia, Croatian Radio	5895va	7165eu	11635na	
2100-2130	Cuba, Radio Havana	13715eu	13725eu		
2100-2200 vl	Cyprus, BRT International	6150do			
2100-2200	Ecuador, HCJB	12015eu	21455am		
2100-2200	Egypt, Radio Cairo	15375af			
2100-2200	Eqt Guinea, Radio Africa	15186af			
2100-2150	Germany, Deutsche Welle	7115au	9670as	9735af	9765as
		11785au	11865af	15135af	
2100-2130	Germany, Adventist World R	9830af			
2100-2130	Hungary, Radio Budapest	3975eu	7250eu	9835eu	
2100-2200	India, All India Radio	7150eu	7410eu	9910eu	9950eu
		11620au	11715au		
2100-2130	Iran, VOIRI	6165pa	6175pa		
2100-2200 vl	Italy, IRRS	3955va			
2100-2200	Japan, R Japan/NHK World	6035as	9535na	13630as	
2100-2107 vl	Kenya, Kenya Broadc Corp	4885do	4935do	6150do	
2100-2200	Lebanon, Voice of Hope	9960va			
2100-2115	Liberia, LCN/R Liberia Int	5100do			
2100-2107	Namibia, NBC	3270do	3290do		
2100-2200 smtwh	New Zealand, R NZ Intl	11735pa			
2100-2106 f	New Zealand, R NZ Intl	9875pa			
2100-2200	Nigeria, FRCN/Radio	3326do	4770do	4990do	
2100-2157	North Korea, R Pyongyang	6575eu	9345eu	11700eu	13760eu
2100-2200 vl	Papua New Guinea, NBC	4890do			
2100-2156	Romania, R Romania Intl	7105eu	7195eu	9690eu	11810eu
2100-2200	Russia, Voice of Russia WS	7250eu	7350eu	7370eu	7440eu
		9620eu	9655eu	9665eu	9710eu
		9740eu	9765eu	9775eu	9880eu
		11840eu			
2100-2200 as	S Africa, World Music R	3345eu	6290af		
2100-2130	Serbia, R Yugoslavia	6100eu	6185eu		
2100-2130	Slovakia, AWR Europe	6055eu	11610af		
2100-2200	South Korea, R Korea Intl	6480eu	15575eu		
2100-2130	South Korea, R Korea Intl	3970eu			
2100-2200 as	Spain, R Exterior Espana	6125eu	11775af		
2100-2105	Syria, Radio Damascus	12085na	13610eu		
2100-2110	Uganda, Radio	4976do			
2100-2200	Ukraine, R Ukraine Intl	5905eu	6010eu	6020eu	6090eu
		7170eu	7240eu	7380au	9550na
		9560na	9640na	12040na	13590na
		13720sa			
2100-2200	United Kingdom, BBC WS	3255af	3915as	3955eu	5965as
		5975as	6005af	6180eu	6190af
		6195va	7325va	9410eu	9630va
		11750sa	11835af	11945as	12095eu
		15400af			
		9630af	15485af		
2100-2130	United Kingdom, BBC WS	11680sa			
2100-2145	United Kingdom, BBC WS	13815am			
2100-2200	USA, KAIJ Dallas TX	15590am			
2100-2200	USA, KTBN Salt Lk City UT	15280as	15665eu		
2100-2200	USA, Monitor Radio Intl	6035af	6040me		7415af
2100-2200	USA, Voice of America	9935af	9760eu	7375af	11975a
				11870pa	

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FREQUENCIES

2100-2200	USA, WEWN Birmingham AL	15185as	15410af	15445af	15580af	2230-2300	Canada, R Canada Intl	5960am	9755am	13670am	
2100-2200	USA, WGTG McCaysville GA	17725af	17735as			2230-2300	Cuba, Radio Havana	6000na	6180na		
2100-2200	USA, WHRI Noblesville IN	5825am	13615na	15745eu		2230-2227	Czech Rep, Radio Prague	7345na	11600na		
2100-2200	USA, WINB Red Lion PA	9400am				2230-2300	Iraq, Radio Iraq Intl	11785eu			
2100-2200	USA, WJCR Upton KY	9495am				2240-2250	Greece, Voice of	7480au	9425au		
2100-2200	USA, WRMI/R Miami Intl	13790eu				2245-2300	Ghana, Ghana Broadc Corp	3366do	4915do		
2100-2200	USA, WRNO New Orleans LA	7490na				2245-2300	India, All India Radio	9705as	9950as	11620as	
2100-2200	USA, WWCR Nashville TN	9955am				2245-2300	Vatican State, Vatican R	7305as	9600as	11830au	
2100-2200	USA, WYFR Okeechobee FL	9475am	12160am	13845am	15685am	2300-0000	Anguilla, Caribbean Beacon	6090am			
2100-2200	Zambia, Christian Voice	17555eu	17845eu	21525eu		2300-0000	Australia, Radio	9660pa	11695as	12080pa	13755as
2100-2200 vl	Zambia, R Zambia/ZNBC 1	3330af	4965af			2300-0000 vl	Australia, VL8K Katherine	15365pa	17750as	17795pa	
2100-2200 vl	Zambia, R Zambia/ZNBC 2	4910do				2300-0000 vl	Australia, VL8T Tent Crk	5025do			
2100-2200 vl	Zimbabwe, Zimbabwe BC	4910do				2300-0000	Bulgaria, Radio	4910do			
2107-2200 f	New Zealand, R NZ Intl	6165do				2300-0000	Canada, CBC N Quebec Svc	7480na	9435na		
2115-2200	Egypt, Radio Cairo	4828do				2300-0000	Canada, CFRX Toronto	9625do			
2115-2130	United Kingdom, BBC WS	11735pa				2300-0000	Canada, CFVP Calgary	6070do			
2120-2200	Sweden, Radio	9900eu				2300-0000	Canada, CHNX Halifax	6030do			
2130-2200	Australia, Radio	6175am	15390am	17715am		2300-0000	Canada, CKZN St John's	6130do			
2130-2155	Austria, R Austria Intl	6065eu	9430af			2300-0000	Canada, CKZU Vancouver	6160do			
2130-2200	China, China Radio Intl	13755pa	17795pa			2300-0000 mtwhf	Canada, R Canada Intl	6160do			
2130-2157	Czech Rep, Radio Prague	5945eu	6155eu	13730af		2300-0000 as	Canada, R Canada Intl	9755am	11940am	13670am	15305am
2130-2200	Ghana, Ghana Broadc Corp	5220eu	6950eu	9920eu				5960am	9755am	11940am	13670am
2130-2200	Guam, AWR/KSDA	11600af				2300-0000	Costa Rica, Adv World R	15305am			
2130-2200	Malawi, MBC	3366do						5030am	6150am	9725am	13750am
2130-2200	South Korea, R Korea Intl	15310as				2300-0000	Costa Rica, RF Peace Intl	15460am			
2130-2200	Uzbekistan, R Tashkent	3380do				2300-0000	Cuba, Radio Havana	7385am	15050am		
2145-2200 a	Greece, Voice of	6480eu	15575eu			2300-2330	Egypt, Radio Cairo	6000na	6180na		
2200-2300	Anguilla, Caribbean Beacon	9540as	9545me			2300-2350	Germany, Deutsche Welle	9900na			
2200-2300	Australia, Radio	7480au	9425au	11730na	17745na	2300-0000	Guam, AWR/KSDA	5980as	7235as	9690as	
		11775am				2300-0000	Guatemala, Adv World R	11775am			
		9660pa	11695pa	12080pa	13755pa	2300-0000	India, All India Radio	9705as	9950as	11620as	
		15510as	17795pa			2300-0000	Lebanon, Voice of Hope	9960va			
2200-2300 s	Australia, Radio	17750pa				2300-2315	Liberia, LCN/R Liberia Int	5100do			
2200-2300 vl	Australia, VL8K Katherine	5025do				2300-0000	Malaysia, Radio	7295do			
2200-2300 vl	Australia, VL8T Tent Crk	4910do				2300-2306 smtwhf	New Zealand, R NZ Intl	11735pa			
2200-2300	Canada, CBC N Quebec Svc	9625do				2300-2315	Nigeria, FRCN/Radio	3326do	4770do	4990do	
2200-2300	Canada, CFRX Toronto	6070do				2300-2357	North Korea, R Pyongyang	11335na	11700na	13650na	13760na
2200-2300	Canada, CFVP Calgary	6030do						15130na			
2200-2300	Canada, CHNX Halifax	6130do				2300-0000 vl	Papua New Guinea, NBC	9675do			
2200-2300	Canada, CKZN St John's	6160do				2300-2356	Romania, R Romania Intl	5990na	6155na	9510na	9570na
2200-2300	Canada, CKZU Vancouver	6160do						11940na			
2200-2300	Canada, R Canada Intl	5960eu	9755am	11705as	13670am	2300-0000	Russia, Voice of Russia WS	7125na	7250na	9665na	
		13740am	15305am			2300-0000	Turkey, Voice of	6135na	7280eu	9655na	
		9880eu				2300-0000	United Kingdom, BBC WS	3915as	5965as	5975am	6175am
2200-2300	China, China Radio Intl	7385am	15050am					9580as	9590na	9915am	11750as
2200-2300	Costa Rica, RF Peace Intl	5895eu						11945as	11955as	15380as	
2200-2210	Croatia, Croatian Radio	9900eu				2300-2315	United Kingdom, BBC WS	15400af			
2200-2245	Egypt, Radio Cairo	15186af				2300-0000	USA, KAIJ Dallas TX	13815am			
2200-2300	Eq Guinea, Radio Africa	4915do				2300-0000	USA, KTBN Salt Lk City UT	15590am			
2200-2215	Ghana, Ghana Broadc Corp	7150eu	7410eu	9910eu	9950eu	2300-0000	USA, KWHR Naalehu HI	17510as			
2200-2230	India, All India Radio	11620au	11715au			2300-0000	USA, Monitor Radio Intl	15280as			
		6150as	9565as	11815pa		2300-0000	USA, Voice of America	7215as	9705as	9770as	11760as
2200-2225	Italy, RAI Intl	9960va						15185as	15290as	15305as	17735as
2200-2300	Lebanon, Voice of Hope	5100do						17820as			
2200-2215	Liberia, LCN/R Liberia Int	7295do				2300-0000	USA, WEWN Birmingham AL	5825na	9975na	13615na	
2200-2300	Malaysia, Radio	7520eu				2300-0000	USA, WGTG McCaysville GA	5085am			
2200-2255	Moldova, R Moldova Intl	11735pa				2300-0000	USA, WHRI Noblesville IN	5745am			
2200-2300 smtwhf	New Zealand, R NZ Intl	11735pa				2300-0000	USA, WINB Red Lion PA	13790am			
2200-2300 f	New Zealand, R NZ Intl	11735pa				2300-0000	USA, WJCR Upton KY	7490na			
2200-2215	Nigeria, FRCN/Radio	3326do	4770do	4990do		2300-0000	USA, WRMI/R Miami Intl	9955am			
2200-2230 s	Norway, Radio Norway Intl	9965sa				2300-0000	USA, WRNO New Orleans LA	7355am			
2200-2300 vl	Papua New Guinea, NBC	9675do				2300-0000	USA, WWCR Nashville TN	5070am	7435am	9475am	13845am
2200-2300	Russia, Voice of Russia WS	7125na	7250na	9620na	9665na	2307-0000	New Zealand, R NZ Intl	15115pa			
2200-2215	Sierra Leone, SLBS	3316do				2310-2315	Kyrgyzstan, Kyrgyz Radio	4010do	4050do		
2200-2300	Taiwan, VO Free China	15600eu	17750eu			2330-2355	Belgium, R Vlaanderen Int	9925sa	11690am		
2200-2300	Turkey, Voice of	7280eu	9560na	9655na		2330-0000 vl	Ghana, Ghana Broadc Corp	4915af			
2200-2300	United Kingdom, BBC WS	5965as	5975am	6175am	6180eu	2330-0000	Netherlands, Radio	6020na	6165na	9845na	
		6195as	7325va	9410va	9590am	2335-2345	Greece, Voice of	9395sa	9425sa	9935sa	11595sa
		9660as	9890as	9915am	11750am			17775sa			
		11835af	11955as	12080as	15400af			3316do			
2200-2230	United Kingdom, BBC WS	12095eu									
2200-2300	USA, KAIJ Dallas TX	13815am									
2200-2300	USA, KTBN Salt Lk City UT	15590am									
2200-2300	USA, Voice of America	7215as	9705as	9770as	11760as						
		15185as	15290as	15305as	17735as						
		17820as									
2200-2230 mtwhf	USA, Voice of America	6035af	7340af	7375af	7415af						
		11975af									
2200-2300	USA, WEWN Birmingham AL	5825na	9975eu	13615na							
2200-2300	USA, WGTG McCaysville GA	9400am									
2200-2300	USA, WHRI Noblesville IN	5745am	9495am								
2200-2300	USA, WINB Red Lion PA	13790am									
2200-2300	USA, WJCR Upton KY	7490na									
2200-2300	USA, WRMI/R Miami Intl	9955am									
2200-2300	USA, WRNO New Orleans LA	7355am									
2200-2300	USA, WWCR Nashville TN	5070am	7435am	9475am	13845am						
2200-2300	USA, WYFR Okeechobee FL	17845eu	21525eu								
2200-2300 vl	Zambia, R Zambia/ZNBC 1	4910do									

HAUSER'S HIGHLIGHTS

JORDAN: PETRA, JORDAN NEWS AGENCY

on RTTY F1B 50 baud to Eu/ME/As daily:

Arabic 0900-1000 on 14560, 9463;

Arabic 1500-1700 on 6830, 5055;

English 1700-1800 on 6830, 5052 [sic]

(BBCM)



SPOTLIGHT ON THE WRN

By **JIM FRIMMEL**

Note: This entire listing is the complete schedule of the World Radio Network (WRN Network 1) to North America. WRN-1 rebroadcasts these programs via the internet (www.wrn.org/)

([sched_us.html](http://www.wrn.org/sched_us.html)) in both the RealAudio and StreamWorks formats. This listing is the result of monitoring the output of WRN-1; no assistance was provided by the

World Radio Network in this creation. Readers should be aware that, for the most part, these are delayed broadcasts which have no relationship to the frequency schedules on the preceding pages.

SUNDAY

- 0000 Radio Australia
- 0000 RA News. See A 1100.
- 0005 Jazz Notes. See A 1105.
- 0030 Innovations. Desley Blanch reports on Australian inventions and innovative practices.
- 0100 YLE Radio Finland
- 0100 News/Weather. See S 1400.
- 0114 Feature Stories from Last Week. A review of last week's main stories.
- 0124 Nunti Latini. See S 1424.
- 0130 Radio Sweden
- 0130 Spectrum (1/4). See A 1930.
- 0200 Radio Prague - Czech Republic
- 0200 News. See S 1300.
- 0205 Live in Prague. See A 1304.
- 0230 Radio Austria International
- 0230 Report from Austria. See A 1630.
- 0231 Letter from Austria. See A 1631.
- 0244 Letterbox. See A 1635.
- 0246 Music. See A 1646.
- 0300 Polish Radio Warsaw
- 0300 The News from Poland. See S 0300.
- 0330 Radio Budapest - Hungary
- 0330 News. A bulletin of world and national news.
- 0400 RTE Radio 1 - Dublin, Ireland
- 0400 News. Two minutes of news from RTE Radio 1.
- 0402 The Irish Collection. See T 0400.
- 0500 Julian Isherwood - Copenhagen
- 0500 Copenhagen Calling. A weekly, independent broadcast produced for WRN by Julian Isherwood in Copenhagen. It is Denmark's only international, English-language broadcast giving news, current affairs, business and cultural coverage of the country.
- 0530 United Nations Radio - New York
- 0530 The World in Review. See S 1330.
- 0600 Polish Radio Warsaw
- 0600 The News from Poland. See S 0300.
- 0630 Radio Canada International
- 0630 News. News from either the Canadian Broadcasting Corporation (CBC) or Radio Canada International (RCI).
- 0635 Venture Canada. A new weekly magazine promoting Canadian business achievement.
- 0700 Radio Australia
- 0700 RA News. See A 1100.
- 0800 Voice of Russia
- 0800 News. See S 2000.
- 0900 Radio Prague - Czech Republic
- 0900 News. See S 1300.
- 0930 Radio Netherlands
- 0930 RN News. See S 2300.
- 1030 YLE Radio Finland
- 1030 News/Weather. See S 1400.
- 1100 Radio Australia
- 1100 RA News. See A 1100.
- 1110 Oz Sounds. Twenty minutes of music selections by Radio Australia announcers.

- 1130 Science File. Ian Wood examines the world of science, medicine and technology.
- 1200 RTE Radio 1 - Dublin, Ireland
- 1200 The News at One. See W 1200.
- 1238 Business News. See H 1238.
- 1240 Sport News. See F 1240.
- 1245 Liveline. See A 1245.
- 1300 Radio Prague - Czech Republic
- 1300 News. World news summary.
- 1305 The Week in Politics. See M 0205.
- 1312 From the Weeklies. Items and editorial opinion from the weekend Czech papers.
- 1319 Media Check. See T 1322.
- 1330 United Nations Radio - New York
- 1330 The World in Review. Recapping the news from the UN during the preceding week.
- 1345 Scope. A news program about the United Nations and its related agencies.
- 1400 YLE Radio Finland
- 1400 News/Weather. World and Finnish news, regional weather, a business report, and currency exchange rates.
- 1405 Editorial Commentary in the Finnish Press. See T 1407.
- 1411 Reports and Features on Life in Finland. See M 1411.
- 1414 Starting Finish. Finnish language lessons for English speakers.
- 1424 Nunti Latini. News. The only program on shortwave in Latin.
- 1430 Radio Vlaanderen International - Belgium
- 1430 News. A world news summary.
- 1435 Radio World. Updates to international broadcasting schedules and what's being heard on shortwave in Belgium.
- 1444 PO Box 26. Listener letters are read and answered in this mailbox program.
- 1500 Radio France International
- 1500 RFI News. World news, French news, press review, sports.
- 1522 Asia File. Correspondent reports and interviews on Asian affairs.
- 1530 News Headlines. See T 1530.
- 1533 Club 9516. Listener letters are read in this mailbag program.
- 1547 Letter from a Listener. See W 1547.
- 1600 Julian Isherwood - Copenhagen
- 1600 Norden This Week. A news and current affairs program dealing with events in Denmark, Finland, Iceland, Norway and Sweden compiled and produced by Julian Isherwood and sponsored by the Nordic Council of Ministers.
- 1615 Independent Production - London
- 1615 Health Watch. A weekly program produced in London about developments in medicine.
- 1630 Radio Austria International
- 1630 Report from Austria. See A 1630.
- 1700 Julian Isherwood - Copenhagen
- 1700 Copenhagen Calling. See S 0500.
- 1730 RTE Radio 1 - Dublin, Ireland

- 1730 The Angelus. Ringing of the church bells of Dublin.
- 1731 The Six O'Clock News. A quarter hour of news from Ireland.
- 1737 Sports News. See A 1737.
- 1800 Radio Vlaanderen International - Belgium
- 1800 News. See S 1431.
- 1804 Radio World. See S 1435.
- 1813 PO Box 26. See S 1444.
- 1830 Radio Netherlands
- 1830 RN News. See S 2300.
- 1837 Wide Angle. The weekend edition of Newline produced by the current affairs team.
- 1855 Siren Song. Dheera Sujan presents an in-depth current affairs story that will capture and hold your attention.
- 1925 World Radio Network
- 1925 WRN Program Guide. See S 2355.
- 1930 Radio Sweden
- 1930 Sounds Nordic. See S 0130.
- 2000 Voice of Russia
- 2000 News. Ten minutes of news every hour on the hour.
- 2011 Sunday Panorama. A magazine program.
- 2030 Polish Radio Warsaw
- 2030 The News from Poland. See S 0300.
- 2038 Panorama. See M 0308.
- 2100 RTE Radio 1 - Dublin, Ireland
- 2100 RTE Radio 1 News at Ten. See M 2100.
- 2102 Drama. A play for radio.
- 2125 Nocturne. Classical music and Irish folk songs.
- 2200 RTE Radio 1 News at Eleven. See M 2200.
- 2202 Sports News. See T 2202.
- 2215 Country Time. See A 2215.
- 2300 Radio Netherlands
- 2300 RN News. Bulletin of world news at the start of all programs.
- 2306 Sincerely Yours. The Sunday replacement for "Happy Station" that lets the listener comment about the RN's programming.
- 2325 Sounds Interesting. Robert Chesal takes listener

HAUSER'S HIGHLIGHTS ALGERIA: R. ALGERIA INT'L

printed sked for May-Sept
 0600-2100 50 kW 11715cu
 1000-2100 100 kW 15160eu
 French Network 3 until 1600 and 1800-1900
 English at 1600, 2000.
 Spanish at 1700, 1900

7245 kHz. 100 kW to Maghreb
 Network 3 0600-0800, 1100-1200, 1300-1500
 Network 2 1500-2000
 Network 1 0800-1100, 1200-1300 (RAI)

NOTE: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

feedback and incorporates their ideas into the show.

2355 World Radio Network

2355 WRN Program Guide. A five-minute resume of upcoming programs.

MONDAY

0000 Radio Australia

0000 RA News. See A 1100.

0010 Correspondents' Report. The ABC's foreign correspondents report home with Hamish Robertson.

0030 The Australian Music Show. Kim Taylor presents the music, people, and issues of the Australian contemporary music industry.

0100 YLE Radio Finland

0100 News/Weather. See S 1400.

0109 Reports and Features on Life in Finland. See M 1411.

0125 Echo. See A 1406.

0130 Radio Sweden

0130 Sounds Nordic (2/4). The very latest and best in Swedish rock and pop music, interviews with the stars, and what's happening on the youth scene.

0200 Radio Prague - Czech Republic

0200 News. See S 1300.

0205 The Week in Politics. A wrap-up of the previous week's political affairs.

0206 Current Affairs. See M 1306.

0209 Press Review. See T 1309.

0212 From the Weeklies. See S 1320.

0230 Radio Austria International

0230 Report from Austria. See A 1630.

0235 Letterbox. See A 1635.

0244 Profile.

0300 Polish Radio Warsaw

0300 The News from Poland. See S 0300.

0308 Panorama. Examining day-to-day life in Poland.

0330 Radio Budapest - Hungary

0330 News. See S 0330.

0336 ...and the Gatepost (1/4). The biweekly feedback slot where listeners have their say on programs and on any subject.

0336 Hungary Today. The new half-hour format includes business (Tue), daily stock market briefs, cultural coverage, and everything else taking place in Hungary.

0400 RTE Radio 1 - Dublin, Ireland

0400 News. See S 0400.

0402 The Irish Collection. See T 0400.

0500 Channel Africa - South Africa

0500 News. See M 1330.

0505 Dateline Africa. See T 1335.

0530 British Broadcasting Corporation (BBC)

0530 Europe Today. All the latest news, analysis and comment.

0600 Polish Radio Warsaw

0600 The News from Poland. See S 0300.

0607 Radio Canada International

0607 The Mailbag. Listener letters, musical selections, and happenings in Canada.

0608 Polish Radio Warsaw

0608 Panorama. See M 0308.

0630 Radio Canada International

0630 News. See S 0630.

0700 Radio Australia

0700 RA News. See A 1100.

0800 Voice of Russia

0800 News. See S 2000.

0900 Radio Prague - Czech Republic

0900 News. See S 1300.

0905 The Week in Politics. See M 0205.

0909 Press Review. See T 1309.

0912 From the Weeklies. See S 1320.

0930 Radio Netherlands

0930 RN News. See S 2300.

0938 Newsline. See M 2308.

1030 YLE Radio Finland

1030 News/Weather. See S 1400.

1037 Editorial Commentary in the Finnish Press. See T 1407.

1042 Reports and Features on Life in Finland. See M 1411.

1100 Radio Australia

1100 RA News. See A 1100.

1110 Dateline. See F 1110.

1200 RTE Radio 1 - Dublin, Ireland

1200 The News at One. See W 1200.

1238 Business News. See H 1238.

1240 Sport News. See F 1240.

1245 Liveline. See A 1245.

1300 Radio Prague - Czech Republic

1300 News. See S 1300.

1305 The Week in Politics. See M 0205.

1306 Current Affairs. People and events in the Czech Republic and editorial commentary.

1309 Press Review. See T 1309.

1311 Magazine '97. See T 0211.

1330 Channel Africa - South Africa

1330 News. Five minutes of international news from the land of the wind-up radio.

1335 Dateline Africa. See T 1335.

1400 YLE Radio Finland

1400 News/Weather. See S 1400.

1407 Editorial Commentary in the Finnish Press. See T 1407.

1411 Reports and Features on Life in Finland. A magazine program.

1430 Radio Vlaanderen International - Belgium

1430 News. See S 1431.

1435 Press Review. See T 1435.

1439 Belgium Today. Current affairs in Belgium.

1446 The Arts. Cultural events in the news.

1500 Radio France International

1500 RFI News. See S 1500.

1526 Review of the French Newspapers. Highlights of articles from the French print media.

1530 News Headlines. See T 1530.

1531 RFI Europe. European press review focuses on current affairs in other countries of the region.

1544 Arts in France. Profile on the work of a French artist or a cultural activity such as music.

1549 Insight. A report on a particular topic of worldwide concern.

1600 Caribbean News Agency (CANA)

1600 Caribbean Tempo. From the island of Barbados, CANA reports on the beat of Caribbean life.

1615 Vatican City

1615 World News. See F 1615.

1630 Radio Austria International

1630 Report from Austria. See A 1630.

1700 British Broadcasting Corporation (BBC)

1700 Europe Today. See M 0530.

1730 RTE Radio 1 - Dublin, Ireland

1730 The Angelus. See S 1730.

1731 The Six O'Clock News. See S 1731.

1746 Farm News. Agricultural news for the farmers of Ireland.

1753 Weather. See H 1753.

1800 Radio Vlaanderen International - Belgium

1800 News. See S 1431.

1806 Press Review. See T 1435.

1811 Belgium Today. See M 1439.

1830 Radio Netherlands

1830 RN News. See S 2300.

1838 Newsline. See M 2308.

1854 Music 52-15. Martha Hawley hosts this program of international music.

1925 World Radio Network

1925 WRN Program Guide. See S 2355.

1930 Radio Sweden

1930 Sixty Degrees North. See W 0130.

2000 Voice of Russia

2000 News. See S 2000.

2011 News and Views. Russian views on news developments.

2030 Polish Radio Warsaw

2030 The News from Poland. See S 0300.

2050 Cookery Corner. See T 0320.

2100 RTE Radio 1 - Dublin, Ireland

2100 RTE Radio 1 News at Ten. A two-minute summary of news from around Ireland.

2102 Ireland Tonight (Part 1). The first hour of this magazine program.

2200 RTE Radio 1 News at Eleven. A two-minute news update.

2202 Sports News. See T 2202.

2214 Ireland Tonight (Part 2). See W 2214.

2255 Weather. See H 1753.

2300 Radio Netherlands

2300 RN News. See S 2300.

2308 Newsline. Correspondent reports, interviews, and commentaries on current events.

2325 Research File. A program of science and technology.

2355 World Radio Network

2355 WRN Program Guide. See S 2355.

TUESDAY

0000 Radio Australia

0000 RA News. See A 1100.

0010 Pacific Focus. See A 0010.

0030 Australia Today. See W 0030.

0100 YLE Radio Finland

0100 News/Weather. See S 1400.

0107 Editorial Commentary in the Finnish Press. See T 1407.

0112 Reports and Features on Life in Finland. See M 1411.

0130 Radio Sweden

0130 Sixty Degrees North. See W 0130.

0131 News. The news segment of Sixty Degrees North.

HAUSER'S HIGHLIGHTS KOREA NORTH: R. PYONGYANG

reorganized its schedule, added German, and expanded all broadcasts from 50 to 57 minutes; English monitored at times previously believed to Ams:

2300 on 11335, 11700, 13760, 15130;
0000 on 11845, 13650, 15230;
1100 on 3560, 9640, 9975, 11335,
13650, 15230

(Sonny Ashimori, Japan, *hard-core dx*)
15230 and 15130 produce mixing
products on 15330 and 15030, such as
in Korean at 2212 (Hans van den
Boogert, Taiwan, DSWCI DX
Window)



NOTE: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

0146 SportScan. See S 0130.
0200 Radio Prague - Czech Republic
0200 News. See S 1300.
0206 Current Affairs. See M 1306.
0209 Press Review. See T 1309.
0211 Magazine '97. Music and interviews about current Czech affairs.
0230 Radio Austria International
0230 Report from Austria. See A 1630.
0300 Polish Radio Warsaw
0300 The News from Poland. See S 0300.
0320 Cookery Corner. Try a recipe from Poland.
0330 Radio Budapest - Hungary
0330 News. See S 0330.
0336 Hungary Today. See M 0336.
0400 RTE Radio 1 - Dublin, Ireland
0400 News. See S 0400.
0402 The Irish Collection. RTE Radio 1's late night service with selected highlights from the previous day's RTE schedule, news and sport, music, documentaries, and drama.
0500 Channel Africa - South Africa
0500 News. See M 1330.
0505 Dateline Africa. See T 1335.
0530 British Broadcasting Corporation (BBC)
0530 Europe Today. See M 0530.
0600 Polish Radio Warsaw
0600 The News from Poland. See S 0300.
0620 Cookery Corner. See T 0320.
0630 Radio Canada International
0630 News. See S 0630.
0641 Spectrum. A weekday magazine program of current affairs, features, and a business report.
0700 Radio Australia
0700 RA News. See A 1100.
0800 Voice of Russia
0800 News. See S 2000.
0900 Radio Prague - Czech Republic
0900 News. See S 1300.
0909 Press Review. See T 1309.
0911 Magazine '97. See T 0211.
0930 Radio Netherlands
0930 RN News. See S 2300.
0938 Newline. See M 2308.
1030 YLE Radio Finland
1030 News/Weather. See S 1400.
1037 Editorial Commentary in the Finnish Press. See T 1407.
1042 Reports and Features on Life in Finland. See M 1411.
1100 Radio Australia
1100 RA News. See A 1100.
1110 Dateline. See F 1110.
1130 The Health Report. A program that examines health issues and makes complex scientific data understandable.
1200 RTE Radio 1 - Dublin, Ireland
1200 The News at One. See W 1200.
1238 Business News. See H 1238.
1240 Sport News. See F 1240.
1245 Liveline. See A 1245.
1300 Radio Prague - Czech Republic
1300 News. See S 1300.
1306 Current Affairs. See M 1306.
1309 Press Review. News items and editorial comment from the Czech newspapers.
1311 Talking Point. Discussion of a topic of concern to the Czech people.
1319 Media Check. News items and editorial comment from foreign press, television, and radio.
1330 Channel Africa - South Africa
1330 News. See M 1330.

1335 Dateline Africa. A news magazine lightly sprinkled with African music.
1400 YLE Radio Finland
1400 News/Weather. See S 1400.
1407 Editorial Commentary in the Finnish Press. Editorial opinion and reports on Finnish and world events.
1411 Reports and Features on Life in Finland. See M 1411.
1430 Radio Vlaanderen International - Belgium
1430 News. See S 1431.
1435 Press Review. Stories on the front pages of the day's papers.
1439 Belgium Today. See M 1439.
1445 Focus on Europe. A report on happenings in the European Economic Community (EEC).
1450 Sports Report. A roundup of the results of seasonal sports activities.
1500 Radio France International
1500 RFI News. See S 1500.
1526 Review of the French Newspapers. See M 1526.
1530 News Headlines. A summary of today's news.
1532 Books. New books, publishing trends, and authors.
1537 Discovery. A weekly feature about the world of science.
1542 News Summary. An update of today's news and sports.
1546 Land of France. A feature on life and times in France.
1551 Echoes from Africa. Report on exports from an African country.
1600 Caribbean News Agency (CANA)
1600 Caribbean Tempo. See M 1600.
1615 Vatican City
1615 World News. See F 1615.
1630 Radio Austria International
1630 Report from Austria. See A 1630.
1700 British Broadcasting Corporation (BBC)
1700 Europe Today. See M 0530.
1730 RTE Radio 1 - Dublin, Ireland
1730 The Angelus. See S 1730.
1731 The Six O'Clock News. See S 1731.
1746 Farm News. See T 1746.
1753 Weather. See H 1753.
1800 Radio Vlaanderen International - Belgium
1800 News. See S 1431.
1806 Press Review. See T 1435.
1811 Belgium Today. See M 1439.
1816 Living in Belgium. Belgian lifestyles and activities.
1819 Green Society. Environmental issues facing Belgium.
1830 Radio Netherlands
1830 RN News. See S 2300.
1838 Newline. See M 2308.
1854 Sounds Interesting. Robert Chesal takes listener feedback and incorporates their ideas into the show.
1925 World Radio Network
1925 WRN Program Guide. See S 2355.
1930 Radio Sweden
1930 Sixty Degrees North. See W 0130.
1946 MediaScan (1/3). Satellite news 85%; medium wave and shortwave news 15%.
2000 Voice of Russia
2000 News. See S 2000.
2011 News and Views. See M 2011.
2030 Polish Radio Warsaw
2030 The News from Poland. See S 0300.
2050 Letter from Poland. See W 0320.
2100 RTE Radio 1 - Dublin, Ireland
2100 RTE Radio 1 News at Ten. See M 2100.
2102 Ireland Tonight (Part 1). See M 2102.
2200 RTE Radio 1 News at Eleven. See M 2200.

2202 Sports News. A 12-minute report on seasonal sports.
2214 Ireland Tonight (Part 2). See W 2214.
2255 Weather. See H 1753.
2300 Radio Netherlands
2300 RN News. See S 2300.
2308 Newline. See M 2308
2325 Mirror Images. Weekly magazine of music, the arts, culture, and European festivals, produced and presented by David Swatling.
2355 World Radio Network
2355 WRN Program Guide. See S 2355.

WEDNESDAY

0000 Radio Australia
0000 RA News. See A 1100.
0030 Australia Today. Colin Tyrus presents the issues, the places, and the characters that make up Australia.
0100 YLE Radio Finland
0100 News/Weather. See S 1400.
0107 Editorial Commentary in the Finnish Press. See T 1407.
0112 Reports and Features on Life in Finland. See M 1411.
0130 Radio Sweden
0130 Sixty Degrees North. Reports, interviews and analysis from Stockholm and other Nordic capitals.
0131 News. See T 0131.
0146 Money Matters. Al Simon presents news about the Swedish economy, business, consumer affairs, and Sweden's EU membership.
0200 Radio Prague - Czech Republic
0200 News. See S 1300.
0206 Current Affairs. See M 1306.
0209 Press Review. See T 1309.
0211 Talking Point. See T 1311.
0219 Media Check. See T 1322.
0230 Radio Austria International
0230 Report from Austria. See A 1630.
0300 Polish Radio Warsaw
0300 The News from Poland. See S 0300.
0320 Letter from Poland. A personal look at Poland today.
0330 Radio Budapest - Hungary
0330 News. See S 0330.
0336 Hungary Today. See M 0336.
0400 RTE Radio 1 - Dublin, Ireland
0400 News. See S 0400.
0402 The Irish Collection. See T 0400.
0500 Channel Africa - South Africa
0500 News. See M 1330.
0505 Dateline Africa. See T 1335.
0530 British Broadcasting Corporation (BBC)
0530 Europe Today. See M 0530.
0600 Polish Radio Warsaw
0600 The News from Poland. See S 0300.
0620 Letter from Poland. See W 0320.
0630 Radio Canada International

HAUSER'S HIGHLIGHTS HAWAII: KWHR

DXing with Cumbre
Sat 0230 on 17510,
Sat 1130 & Sun 1630
on 9930, Sun 1830 on 13625
(Cumbre DX)

Note: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

0630 News. See S 0630.
 0641 Spectrum. See T 0641.
 0700 Radio Australia
 0700 RA News. See A 1100.
 0800 Voice of Russia
 0800 News. See S 2000.
 0900 Radio Prague - Czech Republic
 0900 News. See S 1300.
 0909 Press Review. See T 1309.
 0911 Talking Point. See T 1311.
 0919 Media Check. See T 1322.
 0930 Radio Netherlands
 0930 RN News. See S 2300.
 0938 Newsline. See M 2308.
 0955 Variable Documentary. See W 2325.
 1030 YLE Radio Finland
 1030 News/Weather. See S 1400.
 1037 Editorial Commentary in the Finnish Press. See T 1407.
 1042 Reports and Features on Life in Finland. See M 1411.
 1100 Radio Australia
 1100 RA News. See A 1100.
 1110 Dateline. See F 1110.
 1130 The Law Report. Susanna Lobe brings an insider's perspective to the complexities of the law.
 1200 RTE Radio 1 - Dublin, Ireland
 1200 The News at One. An hour of news about Ireland, business news, sports, and a live telephone interview.
 1238 Business News. See H 1238.
 1240 Sport News. See F 1240.
 1245 Liveline. See A 1245.
 1300 Radio Prague - Czech Republic
 1300 News. See S 1300.
 1306 Current Affairs. See M 1306.
 1309 Press Review. See T 1309.
 1312 From the Archives. An historical look at the Czech people and their lifestyle.
 1319 The Arts. Focus on an particular topic concerning Czech art.
 1330 Channel Africa - South Africa
 1330 News. See M 1330.
 1335 Dateline Africa. See T 1335.
 1400 YLE Radio Finland
 1400 News/Weather. See S 1400.
 1407 Editorial Commentary in the Finnish Press. See T 1407.
 1411 Reports and Features on Life in Finland. See M 1411.
 1430 Radio Vlaanderen International - Belgium
 1430 News. See S 1431.
 1435 Press Review. See T 1435.
 1439 Belgium Today. See M 1439.
 1500 Radio France International
 1500 RFI News. See S 1500.
 1526 Review of the French Newspapers. See M 1526.
 1530 News Headlines. See T 1530.
 1539 RFI Europe. See M 1531.
 1547 Letter from a Listener. David Page reads letters to RFI from worldwide listeners.
 1600 Caribbean News Agency (CANA)
 1600 Caribbean Tempo. See M 1600.
 1615 Vatican City
 1615 World News. See F 1615.
 1630 Radio Austria International
 1630 Report from Austria. See A 1630.
 1700 British Broadcasting Corporation (BBC)
 1700 Europe Today. See M 0530.
 1730 RTE Radio 1 - Dublin, Ireland
 1730 The Angelus. See S 1730.
 1731 The Six O'Clock News. See S 1731.
 1746 Farm News. See T 1746.

1753 Weather. See H 1753.
 1800 Radio Vlaanderen International - Belgium
 1800 News. See S 1431.
 1806 Press Review. See T 1435.
 1811 Belgium Today. See M 1439.
 1817 Around Town. See H 1444.
 1820 The Arts. See M 1446.
 1830 Radio Netherlands
 1830 RN News. See S 2300.
 1838 Newsline. See M 2308.
 1925 World Radio Network
 1925 WRN Program Guide. See S 2355.
 1930 Radio Sweden
 1930 Sixty Degrees North. See W 0130.
 2000 Voice of Russia
 2000 News. See S 2000.
 2011 News and Views. See M 2011.
 2030 Polish Radio Warsaw
 2030 The News from Poland. See S 0300.
 2050 Flashback. See H 0320.
 2100 RTE Radio 1 - Dublin, Ireland
 2100 RTE Radio 1 News at Ten. See M 2100.
 2102 Ireland Tonight (Part 1). See M 2102.
 2200 RTE Radio 1 News at Eleven. See M 2200.
 2202 Sports News. See T 2202.
 2214 Ireland Tonight (Part 2). The second hour of this magazine program.
 2255 Weather. See H 1753.
 2300 Radio Netherlands
 2300 RN News. See S 2300.
 2308 Newsline. See M 2308.
 2325 Variable Documentary. An in-depth treatment of one subject or a short series.
 2355 World Radio Network
 2355 WRN Program Guide. See S 2355.

THURSDAY

0000 Radio Australia
 0000 RA News. See A 1100.
 0100 YLE Radio Finland
 0100 News/Weather. See S 1400.
 0107 Editorial Commentary in the Finnish Press. See T 1407.
 0112 Reports and Features on Life in Finland. See M 1411.
 0130 Radio Sweden
 0130 Sixty Degrees North. See W 0130.
 0131 News. See T 0131.
 0200 Radio Prague - Czech Republic
 0200 News. See S 1300.
 0206 Current Affairs. See M 1306.
 0209 Press Review. See T 1309.
 0214 From the Archives. See W 1312.
 0219 The Arts. See W 1319.
 0230 Radio Austria International
 0230 Report from Austria. See A 1630.
 0300 Polish Radio Warsaw
 0300 The News from Poland. See S 0300.
 0320 Flashback. Polish history remembered.
 0330 Radio Budapest - Hungary
 0330 News. See S 0330.
 0336 Hungary Today. See M 0336.
 0400 RTE Radio 1 - Dublin, Ireland
 0400 News. See S 0400.
 0402 The Irish Collection. See T 0400.
 0500 Channel Africa - South Africa
 0500 News. See M 1330.
 0505 Dateline Africa. See T 1335.
 0530 British Broadcasting Corporation (BBC)
 0530 Europe Today. See M 0530.
 0600 Polish Radio Warsaw

0600 The News from Poland. See S 0300.
 0620 Flashback. See H 0320.
 0630 Radio Canada International
 0630 News. See S 0630.
 0641 Spectrum. See T 0641.
 0700 Radio Australia
 0700 RA News. See A 1100.
 0800 Voice of Russia
 0800 News. See S 2000.
 0900 Radio Prague - Czech Republic
 0900 News. See S 1300.
 0909 Press Review. See T 1309.
 0912 From the Archives. See W 1312.
 0918 The Arts. See W 1319.
 0930 Radio Netherlands
 0930 RN News. See S 2300.
 0938 Newsline. See M 2308.
 0954 Media Network. See H 2325.
 1030 YLE Radio Finland
 1030 News/Weather. See S 1400.
 1037 Editorial Commentary in the Finnish Press. See T 1407.
 1042 Reports and Features on Life in Finland. See M 1411.
 1100 Radio Australia
 1100 RA News. See A 1100.
 1110 Dateline. See F 1110.
 1130 The Religion Report. Hosted by John Cleary.
 1200 RTE Radio 1 - Dublin, Ireland
 1200 The News at One. See W 1200.
 1238 Business News. Two minutes of commercial news and stock market report.
 1240 Sport News. See F 1240.
 1245 Liveline. See A 1245.
 1300 Radio Prague - Czech Republic
 1300 News. See S 1300.
 1306 Current Affairs. See M 1306.
 1309 Press Review. See T 1309.
 1314 Economic Report. Czech financial news.
 1319 I'd Like You to Meet. A studio interview with an interesting Czech personality.
 1330 Channel Africa - South Africa
 1330 News. See M 1330.
 1335 Dateline Africa. See T 1335.
 1400 YLE Radio Finland
 1400 News/Weather. See S 1400.
 1407 Editorial Commentary in the Finnish Press. See T 1407.
 1411 Reports and Features on Life in Finland. See M 1411.
 1430 Radio Vlaanderen International - Belgium
 1430 News. See S 1431.
 1435 Press Review. See T 1435.
 1439 Belgium Today. See M 1439.
 1444 Around Town. Current happenings in Brussels and other centers of culture.
 1448 The Arts. See M 1446.

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1500 Radio France International
1500 RFI News. See S 1500.
1526 Review of the French Newspapers. See M 1526.
1530 News Headlines. See T 1530.
1531 Sports. A summary of the seasonal matches from around the continent.
1533 The Bottom Line. Focus on financial matters.
1539 Planet Earth (biweekly). An interview with an expert on ecological matters.
1544 News Summary. See T 1542.
1547 Letter from a Listener. See W 1547.
1550 North/South (biweekly). Focus on a public activity in France.
1551 Paris Promenade. Spotlight on a city bistro or restaurant.
1600 Caribbean News Agency (CANA)
1600 Caribbean Tempo. See M 1600.
1615 Vatican City
1615 World News. See F 1615.
1630 Radio Austria International
1630 Report from Austria. See A 1630.
1700 British Broadcasting Corporation (BBC)
1700 Europe Today. See M 0530.
1730 RTE Radio 1 - Dublin, Ireland
1730 The Angelus. See S 1730.
1731 The Six O'Clock News. See S 1731.
1746 Farm News. See T 1746.
1753 Weather. The regional weather report and forecast.
1800 Radio Vlaanderen International - Belgium
1800 News. See S 1431.
1806 Press Review. See T 1435.
1811 Belgium Today. See M 1439.
1814 International Report. See F 1445.
1819 Economics. See F 1449.
1830 Radio Netherlands
1830 RN News. See S 2300.
1838 Newslines. See M 2308.
1925 World Radio Network
1925 WRN Program Guide. See S 2355.
1930 Radio Sweden
1930 Sixty Degrees North. See W 0130.
2000 Voice of Russia
2000 News. See S 2000.
2011 News and Views. See M 2011.
2030 Polish Radio Warsaw
2030 The News from Poland. See S 0300.
2050 A Day in the Life Of. See F 0320.
2100 RTE Radio 1 - Dublin, Ireland
2100 RTE Radio 1 News at Ten. See M 2100.
2102 Ireland Tonight (Part 1). See M 2102.
2200 RTE Radio 1 News at Eleven. See M 2200.
2202 Sports News. See T 2202.
2214 Ireland Tonight (Part 2). See W 2214.
2255 Weather. See H 1753.
2300 Radio Netherlands
2300 RN News. See S 2300.
2308 Newslines. See M 2308.
2325 Media Network. Jonathan Marks and Diana Janssen look at the world of broadcasting. Top-rated.
2355 World Radio Network
2355 WRN Program Guide. See S 2355.

FRIDAY

0000 Radio Australia
0000 RA News. See A 1100.
0010 Hindsight. Michelle Rayner presents current events from an historical perspective.
0100 YLE Radio Finland
0100 News/Weather. See S 1400.

0107 Editorial Commentary in the Finnish Press. See T 1407.
0112 Reports and Features on Life in Finland. See M 1411.
0130 Radio Sweden
0130 Sixty Degrees North. See W 0130.
0131 News. See T 0131.
0146 GreenScan (2). Environmental concerns and solutions.
0146 HeartBeat (3). A new monthly health and medical magazine.
0146 Horizon (4/5). Science and technology in Sweden.
0200 Radio Prague - Czech Republic
0200 News. See S 1300.
0206 Current Affairs. See M 1306.
0209 Press Review. See T 1309.
0214 Economic Report. See H 1314.
0219 I'd Like You to Meet. See H 1319.
0230 Radio Austria International
0230 Report from Austria. See A 1630.
0300 Polish Radio Warsaw
0300 The News from Poland. See S 0300.
0320 A day in the Life Of. Anyone from government minister to pop star to bag lady.
0330 Radio Budapest - Hungary
0330 News. See S 0330.
0336 Hungary Today. See M 0336.
0400 RTE Radio 1 - Dublin, Ireland
0400 News. See S 0400.
0402 The Irish Collection. See T 0400.
0500 Channel Africa - South Africa
0500 News. See M 1330.
0505 Dateline Africa. See T 1335.
0530 British Broadcasting Corporation (BBC)
0530 Europe Today. See M 0530.
0600 Polish Radio Warsaw
0600 The News from Poland. See S 0300.
0620 A Day in the Life Of. See F 0320.
0630 Radio Canada International
0630 News. See S 0630.
0641 Spectrum. See T 0641.
0700 Radio Australia
0700 RA News. See A 1100.
0800 Voice of Russia
0800 News. See S 2000.
0900 Radio Prague - Czech Republic
0900 News. See S 1300.

0909 Press Review. See T 1309.
0914 Economic Report. See H 1314.
0918 I'd Like You to Meet. See H 1319.
0930 Radio Netherlands
0930 RN News. See S 2300.
0938 Newslines. See M 2308.
0955 A Good Life. See F 2325.
1030 YLE Radio Finland
1030 News/Weather. See S 1400.
1037 Editorial Commentary in the Finnish Press. See T 1407.
1042 Reports and Features on Life in Finland. See M 1411.
1100 Radio Australia
1100 RA News. See A 1100.
1110 Dateline. Twenty minutes of overseas and local correspondent reports and analyses of regional and global issues and events, including business news.
1130 The Media Report. Agnes Warren presents the inside story on how the communications industry operates and puts the spotlight on media people and their activities.
1200 RTE Radio 1 - Dublin, Ireland
1200 The News at One. See W 1200.
1238 Business News. See H 1238.
1240 Sport News. A five-minute roundup of Irish sports.
1245 Liveline. See A 1245.
1300 Radio Prague - Czech Republic
1300 News. See S 1300.
1306 Current Affairs. See M 1306.
1309 Press Review. See T 1309.
1310 Between You and Us. Information about the Czech Republic, commentary on listener letters, and occasional DX news.
1330 Channel Africa - South Africa
1330 News. See M 1330.
1335 Dateline Africa. See T 1335.
1400 YLE Radio Finland
1400 News/Weather. See S 1400.
1407 Editorial Commentary in the Finnish Press. See T 1407.
1411 Reports and Features on Life in Finland. See M 1411.
1430 Radio Vlaanderen International - Belgium
1430 News. See S 1431.
1435 Press Review. See T 1435.

HAUSER'S HIGHLIGHTS KUWAIT: RADIO STATE OF KUWAIT

Main Program In Arabic

UTC	kHz					
0000-0200	11675					
0200-0400	15505	15495	11675	6055		
0400-0445	17885	15505	15495	11675	6055	
0445-0530	17885	15505	15495	15110	11675	6055
0530-0930	17885	15505	15495	15110	6055	
0930-1305	17885	15505	15495	13620	6055	
1305-1505	17885	15505	15110	13620	9880	
1505-1605	15505	15110	13620	9880		
1605-1615	15505	15110	9880			
1615-1730	15505	15110	11990	9880		
1730-1800	15505	11990	9880			
1800-2130	15505	15495	9880	9855		
2130-2300	15505	15495	9855			
2300-2400	15495	9855				

(BBCM)

Qur'an can be heard very well around 0230 on 11675 (gh)

Note: THIS IS THE OUTPUT OF WRN-1 VIA THE INTERNET (WWW.WRN.ORG/SCHED_US.HTML).

1439 Belgium Today. See M 1439.
 1445 International Report. A background report on current affairs in Europe and elsewhere.
 1449 Economics. Interview with a person in the field of business, finance, or consumerism or a updating report.
 1500 Radio France International
 1500 RFI News. See S 1500.
 1515 Land of France. See T 1546.
 1526 Review of the French Newspapers. See M 1526.
 1530 News Headlines. See T 1530.
 1531 Weekend. Colleagues from BBC World Service, Radio Netherlands and Deutsche Welle are joined for a weekly look at issues and themes important throughout Europe.
 1600 Caribbean News Agency (CANA)
 1600 Caribbean Tempo. See M 1600.
 1615 Vatican City
 1615 World News. A 15-minute bulletin of international news.
 1630 Radio Austria International
 1630 Report from Austria. See A 1630.
 1700 British Broadcasting Corporation (BBC)
 1700 Europe Today. See M 0530.
1730 RTE Radio 1 - Dublin, Ireland
 1730 The Angelus. See S 1730.
 1731 The Six O'Clock News. See S 1731.
 1746 Farm News. See T 1746.
 1753 Weather. See H 1753.
 1800 Radio Vlaanderen International - Belgium
 1800 News. See S 1431.
 1806 Press Review. See T 1435.
 1810 Belgium Today. See M 1439.
 1814 The Arts. See M 1446.
 1819 Tourism. Take an audio tour of the sights and sounds of Belgium.
 1830 Radio Netherlands
 1830 RN News. See S 2300.
 1838 Newsline. See M 2308.
 1854 Variable Documentary. See W 2325.
 1925 World Radio Network
 1925 WRN Program Guide. See S 2355.
 1930 Radio Sweden
 1930 Sixty Degrees North. See W 0130.
 1931 News. See T 0131.
 1935 Newsweek. See A 0135.
 2000 Voice of Russia
 2000 News. See S 2000.
 2011 News and Views. See M 2011.
 2030 Polish Radio Warsaw
 2030 The News from Poland. See S 0300.
 2050 Business Week. See A 0320.
 2100 RTE Radio 1 - Dublin, Ireland
 2100 RTE Radio 1 News at Ten. See M 2100.
 2102 Ireland Tonight (Part 1). See M 2102.
 2200 RTE Radio 1 News at Eleven. See M 2200.
 2202 Sports News. See T 2202.
 2214 Ireland Tonight (Part 2). See W 2214.
 2255 Weather. See H 1753.
 2300 Radio Netherlands
 2300 RN News. See S 2300.
 2308 Newsline. See M 2308.
 2325 A Good Life. Ginger da Silva hosts a program about development in both rich and poor countries.
 2355 World Radio Network
 2355 WRN Program Guide. See S 2355.

SATURDAY

0000 Radio Australia
 0000 RA News. See A 1100.
 0010 Pacific Focus. Coverage of issues of relevance to

people of the Pacific region.
 0030 Australia Today. See W 0030.
 0100 YLE Radio Finland
 0100 News/Weather. See S 1400.
 0107 Editorial Commentary in the Finnish Press. See T 1407.
 0110 YLE Focus. See A 1411.
 0130 Radio Sweden
 0130 Sixty Degrees North. See W 0130.
 0131 News. See T 0131.
 0135 Newsweek. The major stories of the week, both from Sweden and their Nordic neighbors.
 0200 Radio Prague - Czech Republic
 0200 News. See S 1300.
 0210 Between You and Us. See F 1310.
 0230 Radio Austria International
 0230 Report from Austria. See A 1630.
 0300 Polish Radio Warsaw
 0300 The News from Poland. See S 0300.
 0320 Business Week. What's happening in Europe's newest capitalist economy.
 0330 Radio Budapest - Hungary
 0330 News. See S 0330.
 0400 RTE Radio 1 - Dublin, Ireland
 0400 News. See S 0400.
 0402 The Irish Collection. See T 0400.
 0500 Channel Africa - South Africa
 0500 News. See M 1330.
 0530 Glenn Hauser - USA
 0530 World of Radio. Glenn's communications program for shortwave radio listeners.
 0600 Polish Radio Warsaw
 0600 The News from Poland. See S 0300.
 0620 Business Week. See A 0320.
 0630 Radio Canada International
 0630 News. See S 0630.
 0641 Spectrum. See T 0641.
 0700 Radio Australia
 0700 RA News. See A 1100.
 0800 Voice of Russia
 0800 News. See S 2000.
 0900 Radio Prague - Czech Republic
 0900 News. See S 1300.
 0910 Between You and Us. See F 1310.
 0930 Radio Netherlands
 0930 RN News. See S 2300.
 0938 Newsline. See M 2308.
 1030 YLE Radio Finland
 1030 News/Weather. See S 1400.
 1100 Radio Australia
 1100 RA News. Five or ten minutes of world, Australian, and regional news.
 1105 Jazz Notes. The best of Australian jazz is introduced by Ivan Lloyd.
 1130 Indian Pacific. News and analysis from across the Pacific and Asia with Di Martin.
 1200 RTE Radio 1 - Dublin, Ireland
 1200 The News at One. See W 1200.
 1238 Business News. See H 1238.
 1240 Sport News. See F 1240.
 1245 Liveline. The last quarter-hour of the News at One in which a telephone interview is conducted with a person in the news.
 1300 Radio Prague - Czech Republic
 1300 News. See S 1300.
 1304 Live in Prague. Jazz from one of Prague's night spots.
 1330 Channel Africa - South Africa
 1330 News. See M 1330.
 1335 Dateline Africa. See T 1335.
 1400 YLE Radio Finland
 1400 News/Weather. See S 1400.

1406 Echo. YLE's mailbag program.
 1411 YLE Focus. Spotlight on the achievements of a Finn of note.
 1430 Radio Vlaanderen International - Belgium
 1430 News. See S 1431.
 1435 Press Review. See T 1435.
 1439 Music from Flanders. The weekly concert.
 1500 Radio France International
 1500 RFI News. See S 1500.
 1526 Review of the French Newspapers. See M 1526.
 1530 News Headlines. See T 1530.
 1531 Spotlight on Africa. Correspondent reports and interviews on African affairs with Julia Crawford.
 1545 Letter from a Listener. See W 1547.
 1547 News Summary. See T 1542.
 1550 French Lesson. Learn French by radio.
 1600 Glenn Hauser - USA
 1600 World of Radio. See A 0530.
 1630 Radio Austria International
 1630 Report from Austria. A magazine program covering all aspects of Austrian life and events in the news and opening with the latest news bulletin.
 1631 Letter from Austria. Reading of a "letter" that covers the latest goings-on in Vienna.
 1635 Letterbox. Listeners' letters are read and answered on-the-air.
 1646 Music. The native music of Austria.
 1700 United Nations Radio - New York
 1700 The World in Review. See S 1330.
 1715 Scope. See S 1345.
 1730 RTE Radio 1 - Dublin, Ireland
 1730 The Angelus. See S 1730.
 1731 The Six O'Clock News. See S 1731.
 1737 Sports News. All the scores from all the games played today as well as racing results.
 1800 Radio Vlaanderen International - Belgium
 1800 News. See S 1431.
 1805 Press Review. See T 1435.
 1809 Music from Flanders. See A 1439.
 1830 Radio Netherlands
 1830 RN News. See S 2300.
 1838 Newsline. See M 2308.
 1854 Roughly Speaking. An upbeat magazine program for European youth.
 1925 World Radio Network
 1925 WRN Program Guide. See S 2355.
 1930 Radio Sweden
 1930 Spectrum (1/4). Bill Schiller with the latest on Swedish music, drama, art, and film.
 1930 Sweden Today (3). George Wood presents voices from a wide range of people in the Scandinavian nation.
 2000 Voice of Russia
 2000 News. See S 2000.
 2011 News and Views. See M 2011.
 2030 Polish Radio Warsaw
 2030 The News from Poland. See S 0300.
 2100 RTE Radio 1 - Dublin, Ireland
 2100 RTE Radio 1 News at Ten. See M 2100.
 2102 Failte Isteach. Live music show.
 2200 RTE Radio 1 News at Eleven. See M 2200.
 2202 Sports News. See T 2202.
 2215 Countrytime. Forty-five minutes of country music with an Irish accent.
 2300 Radio Netherlands
 2300 RN News. See S 2300.
 2308 Newsline. See M 2308.
 2325 Weekend. Maggie Ayre joins colleagues from BBC World Service, Radio France International and Deutsche Welle for a weekly look at issues and themes important throughout Europe.
 2355 World Radio Network
 2355 WRN Program Guide. See S 2355.

News Service Accused of Illegal Interceptions

By Rachel Baughn, Editor

Communications privacy made the news again on August 27, when New York U.S. Attorney Mary Jo White announced the arrest of three persons connected to the Breaking News Network (BNN) for illegal interception of alpha-numeric paging messages. Steven Gessman, Vinnie Martin, and Jeffrey Moss were charged with mail fraud, conspiracy, and violating the Electronic Communications Privacy Act.

BNN is a company which supplies news tips to news organizations, fire fighters, police, insurance adjusters, and others, for a small fee.

The New York Police Department has been using alpha-numeric pagers to communicate information too sensitive to be transmitted over the radio—information such as location of crime witnesses, condition of injured law enforcement officers or firefighters, and deployment of special units such as the bomb squad. The indictments claim that BNN has been intercepting these communications and selling the information to its clients.

BNN claims to be the first to have reported the crash of TWA Flight 800, and its clients do sometimes beat city officials to the scene of breaking news events. However, BNN's public statement says it gets all of its information from 24-hour monitoring of public police radio channels. BNN says one of their pagers was the only item out of the electronic equipment presented to the press that was theirs.

Earlier in the investigation, Moss allegedly showed investigators how he used a scanner connected to his computer loaded with the "Message Tracker" software program to extract messages from PageNet—the company providing service to the police. By sifting through that information, he could eventually "clone" pagers with the identifiers for a specific recipient.

The defendants, who were all released on bail, face up to five years in prison and a \$250,000 fine if convicted. No charges will be brought against their clients, who presumably were unaware of the alleged source of the information.

BNN maintains that no sensitive information was ever transmitted by BNN to their clients, and that the anonymous charges were likely brought by two disgruntled former volunteers.

Wider Implications

Although no determination appears to have been made that the product itself is illegal, dealers of the Message Tracker have been subpoenaed to turn over information and inventory relating to the software and accessories, pending the outcome of the case.

Manufacturers of equipment capable of decoding communications modes used in paging

networks may decide to terminate shipment until a clearer interpretation of federal law is established.

Regardless of the outcome of this case, it will no doubt bolster the push for stricter laws such as that featured in our cover story, even though the arrests were made under already-existing prohibitions.

Attorney Mary Jo White was correct in her

statement that you should "protect yourself and your privacy by avoiding the use of pagers and cellular phones for sensitive information." Either that, or encrypt—an option made available by both services. However, few people choose to heed the fact that radio waves are in the air, and no wireless communications are secure unless you take steps to ensure it.

MT thanks everyone who provided news clippings on this late-breaking story.

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A world of adventure with the Grundig Yacht Boy 400 shortwave radio. Hear news (in English) direct from the world's capitals... as it happens. The compact, easy to use portable covers all shortwave frequencies plus AM & FM. With keypad entry and digital readout, you won't miss any of the international action!



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PROPAGATION CONDITIONS, UNITED STATES

LET'S TALK THE SAME LANGUAGE!

By Jacques d'Avignon
monitor@rac.ca

PART 2

This month you will find the second of three parts of a glossary of terms that apply to radio propagation and radio propagation forecasting.

Ground Wave

The radio wave which propagates close to the Earth's surface. Severe signal losses due to ground resistance limit the range of ground waves to about 100 km over land and 300 km over sea for the lowest HF frequencies. The ground waves for the higher HF frequencies cover much shorter distances.

Hop Length

The distance a radio wave travels with one reflection from the ionosphere. It will depend on the antenna elevation angle and the height of the reflecting layer.

Ionosphere

That part of the atmosphere that is ionized by the sun's radiation. Extends upwards from about 60 km. The free electrons in the ionosphere support radio wave propagation.

Lowest Usable Frequency (LUF)

The lowest frequency which allows an acceptable grade of HF service.

Maximum Usable Frequency (MUF)

This is the highest frequency for reliable radio communications by the ionosphere. The median MUF is the highest frequency that will be usable at a particular hour for at least 50% of the days of the month.

Multipath Fading

Small time delays can occur in radio signals traveling by a single mode (due to irregularities in the ionosphere) or by mixed modes. The superposition of these multiple echoes will degrade the quality of the received signal.

Optimum Working Frequency (OWF)

This is the lower decile MUF. It is the frequency which is usable for at least 90% of the days of the month.

Polar Cap Absorption (PCA)

The ionization of the D region over the polar latitudes by high energy solar protons causes radio blackouts for trans-polar circuits which can last for several days. PCAs are almost always preceded by a major solar flare on the visible hemisphere of the sun. The time between the flare event and the onset of the PCA ranges from a few minutes to several hours.

Proton Flare

A flare that liberates significant amounts of high energy protons. If this stream intercepts the earth, the protons cause a polar cap absorption (PCA).

OPTIMUM WORKING FREQUENCIES (MHz)

For the Period 15 October to 14 November 1997 Flux=89 SSN=32

UTC	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
TO/FROM US WEST COAST																								
SOUTH AMERICA	24	18	13	12	11	11	11	11	11	9	9	10	9	11	18	23	24	24	25	25	26	26	25	25
WESTERN EUROPE	9	9	9	8	8	8	8	8	9	8	8	*	*	*	12	16	19	19	18	16	13	11	10	9
EASTERN EUROPE (P)	7	8	7	7	8	9	9	9	9	*	*	*	*	9	10	15	14	11	*	*	*	*	*	*
MEDITERRANEAN	12	11	11	11	10	10	10	10	*	*	*	*	*	*	13	17	20	20	15	13	12	12	12	12
MIDDLE EAST (P)	11	11	12	12	10	*	*	*	*	*	*	*	*	9	10	13	13	12	11	*	*	*	*	11
CENTRAL AFRICA	19	17	13	11	11	10	10	*	*	*	*	*	*	17	22	23	23	23	21	22	23	23	21	21
SOUTH AFRICA	17	15	13	11	11	11	11	*	*	*	*	*	*	19	24	24	24	24	22	20	19	18	18	18
SOUTH EAST ASIA (P)	23	22	20	15	*	*	*	*	*	10	9	9	9	9	10	11	15	14	14	12	*	*	*	13
FAR EAST	23	22	19	14	11	10	9	9	10	9	9	9	9	9	10	10	10	10	9	11	17	22	23	23
AUSTRALIA	21	22	23	18	14	*	*	12	11	11	11	11	10	9	9	12	14	14	13	15	18	19	20	21
TO/FROM US MIDWEST																								
SOUTH AMERICA	18	13	11	10	10	11	11	11	9	8	8	9	10	15	20	22	23	23	23	24	24	24	23	22
WESTERN EUROPE	10	10	10	10	10	9	9	9	9	9	9	*	11	15	17	21	22	22	21	19	16	13	11	10
EASTERN EUROPE	7	7	7	7	8	9	9	9	9	*	*	*	*	11	15	17	15	12	11	*	*	*	*	8
MEDITERRANEAN	12	12	12	11	10	10	10	10	*	*	*	*	*	15	19	21	22	22	17	14	13	13	12	12
MIDDLE EAST (P)	11	11	11	10	10	*	*	*	*	*	*	*	*	11	15	16	14	12	*	*	*	11	11	11
CENTRAL AFRICA	17	14	12	11	11	11	11	*	*	*	*	*	*	18	22	24	24	25	24	22	22	23	23	21
SOUTH AFRICA	17	13	12	11	11	11	11	*	*	*	*	*	*	19	23	24	24	24	25	23	20	19	18	18
SOUTH EAST ASIA (P)	21	19	15	*	*	*	*	*	*	9	9	9	9	9	11	15	14	13	13	12	*	*	*	12
FAR EAST	22	20	15	12	10	*	9	9	9	9	9	9	9	9	10	11	11	10	11	*	12	18	23	23
AUSTRALIA	21	22	17	*	*	*	*	11	11	11	11	10	10	10	12	15	14	13	13	15	18	19	20	20
TO/FROM US EAST COAST																								
SOUTH AMERICA	12	10	10	9	10	10	10	9	8	7	7	9	15	19	21	20	20	20	21	21	21	20	19	16
WESTERN EUROPE	9	9	9	9	8	8	8	8	8	8	8	11	17	19	20	21	21	20	19	17	14	12	10	9
EASTERN EUROPE	8	8	8	8	8	9	8	8	*	*	*	10	15	18	19	17	15	13	11	9	9	8	8	8
MEDITERRANEAN	12	11	10	10	10	9	9	9	*	*	*	13	18	21	22	23	23	22	17	14	13	13	13	12
MIDDLE EAST (P)	11	11	11	11	10	10	*	*	*	*	*	12	17	20	21	18	15	13	12	11	12	12	12	12
CENTRAL AFRICA	13	12	12	12	12	12	11	11	*	*	*	15	20	23	25	25	25	26	24	22	23	23	20	16
SOUTH AFRICA	13	12	12	12	11	12	11	*	*	*	*	16	22	24	25	25	25	25	25	23	21	20	19	16
SOUTH EAST ASIA (P)	15	13	*	*	*	*	*	*	*	*	*	9	12	15	16	14	13	12	12	11	11	11	10	11
FAR EAST	18	14	12	*	*	*	10	10	9	9	9	9	10	11	11	11	11	*	*	*	12	16	21	21
AUSTRALIA	20	15	*	*	*	*	11	11	11	10	10	10	14	16	15	14	13	13	15	18	19	19	20	20

*Unfavorable conditions: Search around the last listed frequency for activity.

Reflection

Although a radio wave is actually refracted in the ionosphere, it is often permissible to substitute a simple triangular ray path for the real ray path, as if the ray were reflected from a mirror. Thus radio waves are often referred to as being reflected from the ionosphere.

Refraction The bending of a wave when it crosses a boundary between media due to a change in velocity of the wave. Until it reaches the ionosphere, a radio wave propagates in a straight line. Once in the ionosphere, it is refracted back towards the ground. The amount

of refraction depends on the electron density of the ionosphere and the operating frequency.

Skip Distance The minimum distance from the transmitter for which a sky wave will return to earth when the operating frequency exceeds the vertical incidence critical frequency. Within the skip distance, only ground wave propagation is possible. The only way to reduce the skip distance is to lower the operating frequency.

Sky Wave The radio wave which propagates through the ionosphere. It is often called the ionospheric wave to distinguish it from the direct (line of sight) wave and the ground wave.

When Any "Q" Just Won't Do

It's funny how this column works sometimes. I can go for months, even years without receiving any questions or queries concerning a particular topic. Then, out of the blue, I can get half a dozen letters or e-mails about the same subject. One such topic has floated to the surface. As a matter of fact it surprises me that it hasn't come up in the past. Now that I think of it, it is something that can be very confusing to the beginners in our hobby. That topic is "Q" Signals.

Originally designed for International Morse Code operation, "Q" signals can turn up anywhere. I've heard the terms "QSO," "QRM," "QTH," and "QRT" spoken by police departments on my scanners. I've had hobbyists walk up to me at radio conventions and say "QRU?" I've sent and received "QSL" cards. I enjoy operating "QRP" and I read "QST" every month.

Technically, "Q" signals are regulated by the international Telecommunications Union as a standard set of abbreviations for use with the international Morse code. However, if you check their Internet Website and run a search, it appears that they don't give much thought to them these days. Most of the "Q" signals in common usage are more a matter of mutual agreement than international regulation. Beyond the conventions of the hobby, organizations such as the American Radio Relay League have even established subsets of "QN" signals designed exclusively for use in CW net operations.

So even though some "Old Timer" might get on two meters and scold you for using "Q" signals in voice mode, the general rule with "Q" signals seems to be that they are used by any two or more folks who agree to use them in their communication, CW, RTTY, voice, or whatever mode. (Now that should generate a little mail). Get over it folks! If you've been reading this magazine for the last few issues you know that Uncle Sam is breathing down our necks about much more important things than our "inappropriate" use of "Q" signals. Anyway, you loyal readers of the *Beginners Corner* asked for it, so here's a look at the current crop of commonly used "Q" Signals.

QRA - The first thing to remember is that "Q" signals can be used as either a statement or a question. Let's use the first "Q" signal as an example. If someone sent me (using the CW mode) *QRA?* (note the question mark),

they are asking "What is the name of your station?" You would respond "QRA is N2EI."

QRG - means "My exact frequency is..." Suppose someone is trying to "zero beat" your signal for maximum efficiency. You may have enough information about your transmission (e.g., crystal control) that you can send "QRG is 7150 kHz."

QRH - Usually sent as a question (QRH?), this means "Does my frequency vary?" A response might be "QRH 5 kHz" to indicate the amount of signal drift you have detected.

QRI - Also often sent as a question (QRI?), the sender wants to know "How is my tone?" This is usually important in CW operations. A response would be "QRI 3." Tone is usually judged on a scale of 1 through 5, with 1 being nearly unintelligible and 5 being excellent.

QRK - Similar to QRI, it refers instead to signal intelligibility. You would respond to "QRK?" by sending back "QRK 4," again using the 1 through 5 rating system.

QRL - Again, most often heard as a question, it is a quick way of asking "Are you busy?" If you send "QRL?" and hear back "QRL" and nothing more, check back with your friend a little later. Very useful in net operations.

QRM - Heard all too often, "QRM" means "My transmission is being interfered with." With narrow filters, directional antennas, and propagation effects, interference can be unintentional. Best to just "QSY." (See below.)

QRN - Sometimes confused with "QRM," "QRN" refers to static and atmospheric noise as opposed to interference from another station or service.

QRO - is sent when you want the station on the other end to increase their power. Common usage among the amateur community is in reference to stations or equipment capable of operating at full legal power. (e.g., "John just bought a QRO amplifier.")



QRP - is sent to request a reduction in power. Remember that FCC and international regulations expect a station to use the least amount of power for good communication to avoid interference. Maybe somebody should explain this to the "pager" industry and those AM broadcast stations that run 150% modulation. The

term also refers to that subculture in ham radio that likes to operate with equipment running under 5 watts. A further unofficial use is QRPp which is used to refer to operation with less than 1 watt. You'd be amazed at how far you can get on a couple of milliwatts.

QRQ - is usually heard in the realm of those speed demons on the low end of the Extra Class portions of the bands. This means "Send faster."

QRS - Most often heard in the Novice Class CW bands, this signal means "Send slower."

QRT - Used to indicate that you are about to stop transmitting. You will often hear voice operators saying they are "Going to go QRT for dinner." This indicates that you are shutting down your station.

QRU - Most often heard as a question, it technically means "Do you have anything for me?" Many hams use it as a way of saying "What's up?" or "What's happening?"

QRV - is sent to indicate readiness. Let's say you are about to send somebody a long piece of traffic. You want to make sure they have their pencils and paper in place so you send "QRV?" If they come back with "QRV" you can start your traffic.

QRW - If you're calling someone and they can't hear you, another station can indicate their ability to relay your signal by sending "QRW." It can also mean "I can tell (whoever) that you are calling them." This would indicate the ability to establish a "QSP." (See below.)

QRX - would probably be sent by my

mother if she were a ham. It most often appears as a question and it means "When will you call again?" You would use this to set up a "sked." "QRX Wed 1400 7150" means you'll try to communicate on Wednesday at 1400 hours UTC on 7150 kHz.

QRZ - Sent as a question, it means "Who is calling me?" Often heard during contest operations to indicate someone is on frequency and waiting for stations to call them. The more technically correct use is to get a fill in on a partial callsign.

QSA - indicates signal strength. Sending "QSA 5" indicates excellent signal strength, again using the 1 through 5 scale.

QSB - is used to indicate fading, usually due to propagation losses along the signal path. If you were to indicate "QSB," you and your contact might "QRS" and "QRO" in an attempt to improve "QRK."

QSD - Here's one that is on the list that I've never heard sent. "QSD?" asks the question "Are my signals mutilated?" I would think if things were that bad no communications would be established.

QSG - is used in traffic handling to indicate the number of messages you want sent at a time. "QSG 5" would indicate that you want the other station to send five messages in each transmission.

QSK - indicates a particular kind of CW operation called "Break in." "QSK" indicates a station that has the ability to receive between the dots and dashes that are sent in CW. This can be important in an emergency because, while a station is sending a transmission, they can hear another station attempting to "break in," allowing the sending operator to stop and hear the breaking station. This is also useful in contests, as a station can "break in" to your call for contacts, thereby saving time. You'd be surprised how much information can sneak in between those dots and dashes.

QSL - Even beginners have heard this one tossed around. Technically this means "I acknowledge receipt." On the air it is used to indicate that you got the message. It is also used to refer to the confirmation (QSL) cards that amateurs swap as record of their contacts. Also, many shortwave broadcast stations send out QSL cards in response to signal reports sent in by listeners.

QSM - is sent when you want the station to repeat their last message. Under conditions of "QSB," you may have to "QSM" several times before you can "QSL."

QSO - generally refers to any radio contact, but it has a specific technical meaning. "QSO" is an indication of direct communication between two stations without relays (QSP).

QSP - If you can't establish a "QSO" you may need to ask someone to "QSP." This indicates relaying a signal between two stations.

QST - In addition to being the name of the ARRL magazine, "QST" indicates a message sent to all amateur radio operators listening. It is an indication of a message of general interest to the ham community, such as a bulletin.

QSV - The most obvious of "Q" signals means "Send a series of the letter 'V.'" This can be used to help a station "zero beat" or get exactly on the frequency of operation.

QSW - indicates transmitting frequency. "QSW 7150" means "I will transmit on 7150 kHz."

QSX - indicates receive frequency (not always the same as transmitting frequency). "QSX 7200" means "I will receive on 7200 kHz."

QSY - indicate a frequency change. You will often hear "QSY up 5" to indicate that the station is moving its operation up 5 kHz in frequency, often to avoid "QRM."

QSZ - This is used in message transmission to tell the station to repeat words to assure clarity. "QSZ 2" means "send every word twice."

QTA - indicates canceling a particular message in a group. "QTA 3" indicates canceling message number 3.

QTB - is sent as a question to check the word count of a message. "QTB 50?" answered by "QTB 50" would mean the message went through intact.

QTC - indicates the number of messages sent. "QTC 10" means ten messages were sent.

QTH - I've even heard this one used on Citizens Band. "QTH" identifies location. My QTH is New Jersey. Bob Grove's QTH is Brasstown.

QTR - is used to ask for or send a time check. If you send "QTR?" and the other station responds "QTR 1200," this indicates the current time is 1200 UTC.

QTV - indicates that you will wait on frequency for someone. "QTV?" would ask the question "Shall I stand by for you?"

QTX - means "I will keep my station open." Think of it as the opposite of "QRT."

QUA - means "I have news of ..." A QST is usually a signal that will contain "QUA."

Well, there you have a good list of common usage "Q" signals. Use them at your discretion. Remember, they only convey the message intended if both you and the station on the other end know what they mean. Otherwise you will need to QSM in plain language. QSL?

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We Have Our Winners!

A few months ago, we challenged readers to submit their all-time best intercepts in the Longwave DX Award (LDXA) contest. Dick Pearce (VT) racked up a total score of 409 points—and he did it with just 10 beacons—all of which were 25 watt stations.

As you may recall, the contest did not require just pulling in long distance contacts, but instead, focused on the *power output* of the stations. Dick could have claimed a few of his South American catches—and amassed an impressive mileage score in the process—but it was *miles-per-watt* that counted in this contest. As Grand Prize Winner, Dick will receive a copy of *The Art of NDB DXing* by Sheldon Remington, 1988 (re-published by Stephen P. McGreevy, Oct. 1996).

Allen Renner (PA) was our second runner-up with 211 points. Allen achieved this score by also focusing on 25 watt stations. His receiving equipment consists of a Realistic DX-440 receiver and a Homespun Loop as described in the September '92 *Below 500 kHz*. As 2nd place winner, Allen will receive a copy of the cassette tape *VLF RADIO! "The Sounds of Longwave."*

Congratulations to both of our winners, and to all who participated in the contest. Each contestant will receive an LDXA wall certificate for their efforts. The winning entries from both Dick and Allen are listed below in Table 1.

TABLE 1. LDXA WINNING ENTRIES

FREQ.	ID	LOCATION	MILES/WATT	BY
290	TVK	Centerville, IA	41	D.P.
353	QG	Windsor, ONT	17	A.R.
385	HYX	Saginaw, MI	20	A.R.
397	A	Hamilton, ONT	13	A.R.
398	G	Windsor, ONT	17	A.R.
417	EOG	Greensboro, AL	34	A.R.
417	HHG	Huntington, IN	21	A.R.
417	IY	Charles City, IA	38	D.P.
419	RYS	Grosse Isle, MI	17	A.R.
421	EF	McKinney, TX	56	D.P.
423	CKP	Pilot Rock, IA	45	D.P.
423	DXE	Dexter, MO	32	A.R.
423	DXE	Dexter, MO	42	D.P.
424	RVJ	Reidsville, GA	35	D.P.
426	FTP	Ft. Payne, AL	35	D.P.
426	IZS	Montezuma, GA	38	D.P.
429	IKY	Springfield, KY	22	A.R.
432	IZN	Lincolnton, NC	18	A.R.
432	MHP	Metter, GA	35	D.P.
518	GCT	Guthrie Center, IA	44	D.P.

Reader Request

Tod Warr (PA) was one of the many people that responded to my request for a Realistic DX-160 service manual. He has an equipment need that I'd like to share with readers. He is looking for a Science Fair Globe Patrol shortwave re-

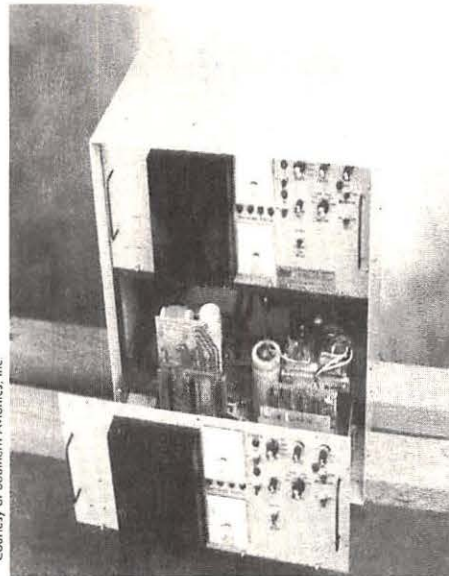


FIGURE 1. Beacon Transmitter

ceiver (Radio Shack #28-205) as well as a Zenith "Owl" radio in any condition. The latter set was a promotional radio put out by Zenith around 1976. It has an owl's head sticker by the tuning window and is for AM broadcast only. If anyone has information on where these sets might be found, please drop me a note and I'll pass it on.

Homebrewer's Challenge

At first it wasn't so bad. Marine beacons (285-325 kHz) that were converted to Differential GPS (DGPS) kept their traditional Morse Code ID—even though it was sent in a warbled fashion. Within a year, however, the Morse ID was dropped entirely on most DGPS beacons, putting an end to DXing them in the traditional sense. Can the FAA beacons be far behind? I believe now is the time for action.

I'd like to challenge our technically-inclined readers to design a simple circuit for decoding the DGPS data stream. Ideally, this would require only a handful of parts and connect directly to a PC for display of the data. It's my understanding that the data stream contains an ID number that could be read and used to locate a particular station. (Many of these ID numbers are in fact listed on the Internet at: <http://www.starlinkdgps.com/gpsinfo.htm>)

We won't go into technical detail here about DGPS signals, other than to say that they are sent using Minimum Shift Keying (MSK) at speeds of 100 and 200 bps. Details on the DGPS protocol are given in the Radio Technical Commission on Marine Services (RTCM) publication SC-104, which can be obtained

from the RTCM, P.O. Box 19087, Washington, DC 20036.

Another excellent source for general DGPS information can be found on Starlink's Web site at: <http://www.starlinkdgps.com/gpsinfo.htm>. How about it? Can anyone out there suggest a suitable design? I would be happy to present this as a construction project in *Below 500 kHz*.

NDBs—A Look Inside

If you've been a reader for very long, you know that I enjoy showing what's behind the signals we hear. To get a look at the inside of a beacon transmitter, I turned to Southern Avionics, Inc., one of the leading manufacturers of Non-Directional Beacon (NDB) equipment.

Jerry Ellis of Southern Avionics supplied a picture of one of the firm's most popular transmitters (see figure 1). There are actually two transmitters in the enclosure—one main, and a backup that takes over in the event of a failure in the main unit. Many of the beacon signals you hear probably originate from a unit such as this.

Southern Avionics also makes antennas, couplers, alarm receivers and many other beacon accessories. Their web site has some excellent write-ups on how beacons are used and what is required for typical installations. You'll find it at www.southernavionics.com/.

End Notes

If you live in the Northeastern U.S., keep an ear open on 185.000 kHz later this fall for my Lower beacon "KC." After many years of inactivity, I am planning to resurrect this station and would appreciate reception reports from *MT* readers.

As always, I'd enjoy hearing from you with your loggings, questions and comments for *Below 500 kHz*. Send your letters to Monitoring Times, P.O. Box 98, Brasstown, NC 28902. An SASE guarantees a response. See you next month!

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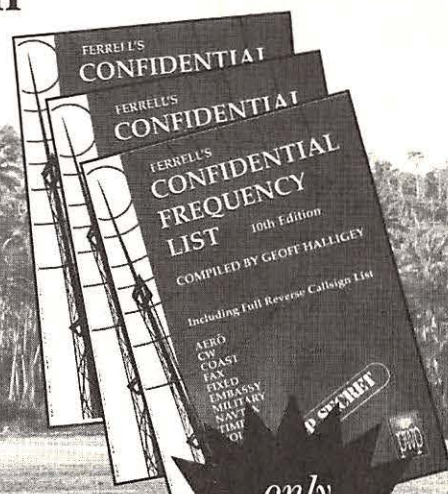
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Myths of the Domestic Dials

I'm sure we're all familiar with the "urban legend." These are stories that just won't die, no matter how often they're refuted. Domestic broadcasting has its own myths, and I'm going to take some space this month to burst a few bubbles.

The longest-lived myth is that of trans-Atlantic delayed reception of Houston TV station KLEE-TV, three years *after* the station changed its call letters to KPRC-TV. This reception occurred in 1953—at the height of the Cold War and UFO mania. As you might expect, some rather exotic (and occasionally paranoid) theories were developed to explain this one. Unfortunately, the real explanation of this reception—a hoax pulled off by some British con men trying to attract investors to a "light cell" antenna—didn't get nearly as much press. (See June 1996 *American Bandscan* for more information on this incident)

Another myth that keeps rising from the dead is the belief that the FCC is about to ban religious broadcasting. This one got its start in 1975. Two individuals with a long history in community radio filed a petition asking that the Commission consider changing its rules to prevent religious organizations from building stations on FM frequencies and TV channels reserved for educational use.

Their petition did *not* propose to prohibit religious stations on unreserved, commercial frequencies, nor did it propose to prohibit stations operated by commercial outfits or community organizations from airing religious programs. In any case, it became a moot point on August 1 of 1975 when the FCC decided the Constitution prevented it from discriminating between secular and religious educational institutions. The petition was denied.

But not until a whole lot of paper was wasted! Rumors spread that atheist activist Madalyn Murray O'Hare had filed a petition to prohibit the licensing of religious stations. Other rumors suggested all religious programs—even Sunday morning church services on normally secular stations—were to be banned. The Commission estimated that it had received over 700,000 informal letters urging the preservation of religious broadcasts.

One would think the paper avalanche would have stopped when the FCC denied the re-

quest. It didn't. Even though over 20 years have passed, FCC officials say they still receive hundreds of letters from citizens fearing the removal of all religious programs from the airwaves. In fact, the original August 1975 decision is still posted on the FCC Web page (www.fcc.gov/mmb/asd/decdoc/letter/1975-08-13-religious.html), the only 20-year-old document on their Internet site. If someone in your church asks you for the FCC's address to file comments on this issue, please do the Commission a favor and show them a copy of this document!

Some more recent rumors have to do with the new digital TV system. One correspondent was told the new DTV receivers would be programmed with your ZIP code, and would refuse to receive any TV stations not licensed to cover your community. Obviously, this would be a severe problem for TV DXers!

I suspect this one came from a DSS satellite subscriber. When you sign up for DSS satellite service, you can request access to ABC/CBS/Fox/NBC affiliates over the satellite. However, this access can only be granted if you live in an area where these signals cannot be received over the air with a rooftop antenna. The DSS distributors must forward your location to the local network affiliates, who must agree that you live in an area of poor reception. My guess is that someone got this process confused with the new DTV system.

Another recent rumor is that, even without ZIP code restrictions, DTV (and digital radio) cannot be DXed. DXing will certainly be *different* in digital, just as scanning changes when your local fire department moves from low-band to a trunked system. But switching from analog to digital doesn't change the laws of nature and signal propagation. A signal on 500MHz (channel 18) will travel through a tropospheric duct with equal ease if it's an analog TV signal, a digital TV signal, or even a land-mobile two-way FM signal. Don't throw

out your antennas; TV DX will be around for decades to come.

■ Bits and Pieces

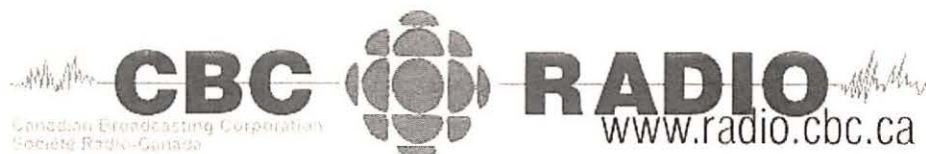
The Canadian Radio-Television Commission has struck again. Early in July, three major CBC AM stations in Quebec (690 and 940 in Montreal, and 980 in Quebec City) were granted permission to move to the FM band.

Now, the most widely-monitored CBC AM station will also be disappearing. CBL-740 Toronto has been granted permission to take over the old CKO-FM frequency. (99.1MHz, 35.2 kW from the CN Tower) The AM station will continue to operate for 6 months after the FM comes on the air. I suspect the old CKO-FM transmitter may still be in place—and the tower and transmitting antenna definitely are—so if you live in the Toronto, Buffalo, Hamilton, or Rochester areas you may well be hearing the CBC on FM by the time you read this.

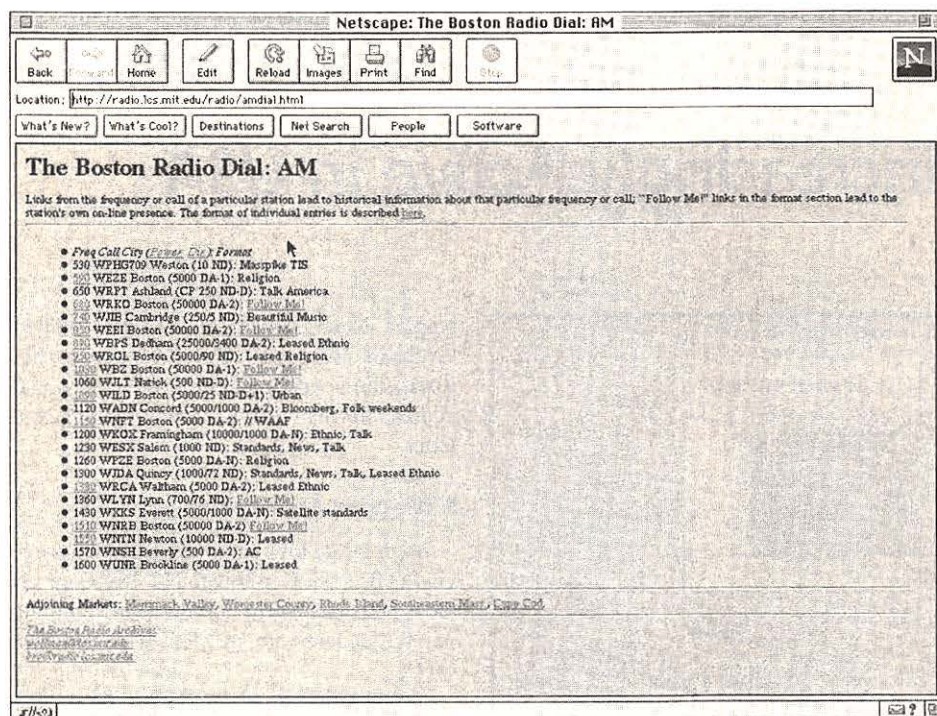
If the FM transmitter does come on the air as soon as I suspect, CBL AM will be disappearing in the middle of the 1998 DX season. KTRH-740 Houston will probably replace CBL as the most-heard station on radios in the region. However, I also expect one of Toronto's other AM stations to take over the 740 frequency, so it may not be open for long.

Incidentally, FM DXers in the area will also find new relayers of the new CBC FM station on 89.1 at Paris and on a yet-unassigned frequency (probably 90.5) at Crystal Beach. CBCO-91.5 Orillia will increase power from 3100 watts to 5200.

The window for expanded-band AM applications has now closed. Much to my surprise, only about half of eligible stations seem to have applied. The FCC hasn't yet acted on any of these applications, but I would expect to begin hearing additional expanded-band



Some of Canada's most popular DX catches belong to the CBC—and will be disappearing soon. Be sure to log the CBC stations on 690, 740, 940, and 980 kHz before they become a part of history!



The Boston AM Radio Dial is just one of a variety of interesting items on the Boston Radio Archives Web Page. Take a look at radio.lcs.mit.edu/radio/amdial.html.

stations in a few months.

A. Joseph Ross of Boston wrote to pass along information of value to New England DXers. He's a member of the Boston Radio Mailing List on the Internet. (boston-radio-interest-request@mercury.lcs.mit.edu to subscribe) And, he suggests a look at the Boston Radio Archives Web Page (radio.lcs.mit.edu/radio/bostonradio.html) for historical information about AM, FM, and TV stations in the area.

New England DXers who don't have access to the Internet aren't left out, though. Bob Bittner (who I believe is also a DXer) hosts the 30-minute program "Let's Talk About Radio." It airs Sundays at 12:05PM on WJIB-740 Cambridge, WNEB-1230 Worcester, and WJTO-730 Bath; and Saturdays at 9AM on WKBR-1250 Manchester.

Ross also corrected something I wrote in May about silent stations beating the deadline for returning to the air. I listed WRPT-650 as a New Hampshire station; he notes it moved to Ashland, Massachusetts, to return to the air. WRPT and WJLT-1060 both use the WKOX-1200 towers in Framingham.

SW and AM DXer Sandra Piotrowski of suburban Detroit got in on a bit of FM DX in late June. While camping, Sandra hooked her Superadio to the poles on the awning of her camper, trying to receive local WRIF-101.1. At 8:45pm, she got a clear ID from KFDI-FM (101.3) Wichita, Kansas. The signal was intermittent but strong. During the hour-long sporadic-E opening, Sandra also got a posi-

tive ID from KSL-101.5 Liberal, Kansas. She's sent reception reports & is awaiting some QSLs.

Unfortunately, it was a very poor sporadic-E season this year. However, there have been a few other reports of good reception like Sandra's. We're now at the peak of the tropospheric bending season for DXers in the Great Lakes and Atlantic Coast regions. And, of course, as the nights get longer the AM band gets better. If you haven't logged the CBC on AM yet, you'd better start now; several of the strongest outlets will be gone by the time the 1998-1999 DX season starts. What are you hearing? Write me at Box 98, Brasstown NC 28902-0098, or by email at 72777.3143@compuserve.com.

DX TEST

Saturday, October 4, 1997: KTGG-1540, c/o Spring Arbor College, 106 East Main Street, Spring Arbor, MI 49283 will conduct a DX test at 450 watts nondirectional between 12:00 & 12:30 am EDT. The test will include classical, march, and Christian rock music, plus voice IDs, test tones and Morse code IDs. Reception reports may be sent to: Mr. Lewis Munn - Chief Engineer. (Test arranged by J.D. Stephens). E-Mail: lmunn@admin.arbor.edu; Web: <http://www.arbor.edu/wsae/ktgg.htm>

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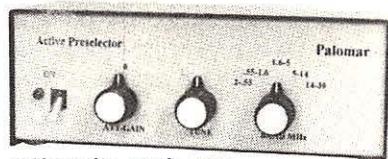


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FM Pirates Increasingly Active in USA

Scores of local FM pirates operate daily across the United States. They aren't as well organized in a national network as their shortwave cousins. Their signals generally get out only a few miles. But given their large numbers, they have a substantial nationwide audience.

Scott Krauss of Cleveland, Ohio, sends in press accounts of **WSPL**, operating as a commercial Hispanic station on 90.7 MHz in Cleveland, Ohio. I hear their Puerto Rican Salsa throughout Cleveland and some of its inner suburbs. *The Cleveland Free Times* speculated that the FCC is enforcing local FM pirates very gingerly, pending the outcome of litigation still in progress on Steve Dunifer's **Radio Free Berkeley** in California.

Raymond Gramm of Seminole, Florida, sends in a *St. Petersburg Times* article about five different pirates operating in the Tampa area on 88.0, 89.3, 90.1, 96.7, and 102.1 MHz. Jeff Ryan in Yardley, Pennsylvania, heard **WXFG** in Trenton, New Jersey on 105.7 MHz. On the way back from a Phillies game, he also heard **WZXI** on 95.3 MHz from Philadelphia, announcing a phone number of (215) 404-0040. Finally, Harold Frodge of Midland, Michigan, notes that his local pirate on 88.3 MHz now identifies itself as **Tower Boy Network**.

■ Metallica News

Dr. Tornado, who took the pirate world by storm this summer with his daily pirate activity using a 10,600 watt transmitter, makes news once again this month. Since his 100th transmission, he's scaled back his formerly near-daily schedule. But, the station is still active. Look for its new service on 11885 kHz. Given current propagation conditions, the 11 MHz shows are skipping over many listeners in eastern North America, but Shawn Axelrod in Winnipeg, Manitoba, Kenny Love in Columbia, South Carolina, and William Hassig in Mt. Prospect, Illinois, all heard one!

As we see here this month, hundreds of QSL's are arriving from both Metallica and from Metallica parody **Radio Tornado Worldwide**. Dr. Tornado tells *MT* that although he used many transmitter parts and subassemblies from George Donahue of



WJDI, much of the construction work on Metallica's superpowered wideband audio transmitter was completed by Dr. Tornado himself.

■ Radio London Returns

Radio London, known as the "Big L" and "Wonderful Radio London" during its 1967 run from the *Galaxy*, a converted World War II minesweeper in the North Sea, returned to the airwaves in July and August on 266 meters medium wave. This time the pirate had a license from the Radio Authority in the UK, in commemoration of the 30th anniversary of a British government crackdown on offshore pirates. Original DJ's were reunited to host the station's original playlist of rock, with proceeds donated to charity.

This station claims the world's first radio broadcast of the Beatles' *Sgt. Pepper's Lonely Hearts Club Band* album. Its jingles survive on an early rock album from The Who. Thanks to Dave Alpert of New York City, who forwarded a Reuters news item on the special broadcasts.

■ Radio Jemima

Rob Ross of London, Ontario, sends in multiple logs of New Zealand pirate **Radio Jemima**. They operate on 7475 kHz in the 0600-0800 UTC range, sometimes relaying **KIWI** broadcasts. Dick Pearce also heard them in Brattleboro, Vermont. Rob already has their QSL from PO Box 16-002, Tamatea,

Napier, New Zealand. In a related matter, Graham Barclay of **KIWI** says that **kiwiradio@writeme.com** is the new e-mail address for his weekly internet pirate newsletter.

■ What We Are Hearing

Your pirate loggings are always welcome via PO Box 98, Brasstown, NC 28902, or via the e-mail address at the top of the column. All frequencies are in kHz, with times in UTC.

North American pirate stations listed here use the following addresses: PO Box 1, Belfast, NY 14711; PO Box 109, Blue Ridge Summit, PA 17214; PO Box 28413, Providence, RI 02908; PO Box 146, Stoneham, MA 02180; PO Box 11522, Huntsville, Alabama 35814; and PO Box 293, Merlin, Ontario N0P 1W0. For return postage, enclose three 32¢ stamps in the envelope to USA addresses. \$2 US or two International Reply Coupons go to foreign maildrops.

6955 Radio- 6955 (what else?) at 0030. This new one features theme music from old TV shows, probably as a parody of Radio Metallica. Addr: None. (Chuck Morford, Fuquay-Varina, NC)

6YVOS- 6955 at 0100. Pigpen Marley usually mixes reggae music and marijuana promotions, but lately he's been adding Grateful Dead commemorations. Addr: Providence. (Matt Haston, Taylors, SC; Rich and Talea Jurens, Katy, TX; Lee Silvi, Mentor, OH; Neil Wolfish, Toronto, Ontario; Axelrod)

Alan Masysa Project- 6955 at 2300. Their Alan Parsons Project rock music is dedicated to veteran DXer Alan Masysa. Addr: Providence. (Harold Frodge, Midland, MI; Jurens; Silvi; Wolfish)

Altered States Radio- 6955 at 2145. William Hurt spices his rock music with comedy, sometimes from Beavis and Butthead. Addr: Merlin. (Michael Prindle, New Suffolk, NY; Frodge; Silvi)

Cherokee Radio- 6955 at 0415. Although their slogan is, "Native American Broadcasting," they primarily feature rock music. Addr: None. (Jurens)

FBI Radio- 6955 at 0045. Ross reports a QSL from the pirates at Females Broadcasting Interference. Addr: Huntsville. (Ross Comeau, Andover, MA)

Free Hope Experience- 6955 at 0200. Major Spook is back with a mix of rock music and comedy, with CW Morse code identifications during broadcasts. Addr: Blue Ridge Summit. (Barry Williams, Enterprise, AL; Haston; Jurens;

Majewski)

Free Radio Maker- 6955 at 2330. In July we asked for their address, which is PO Box 561, Postal Code 4330 A.N., Middelburg, The Netherlands. Thanks, William! (William Stibgen, Horsham, PA)

Friday Radio- 6955 at 2245. This one promotes the weekend, and broadcasts only on one day of the week. Guess which one? Addr: Providence.

(Greg Majewski, Oakdale, CT; Haston; Jurrens)
India Calling- 6955 at 0000. This parody of **All India Radio** is mailing QSL's showing a map of Rhode Island, with all place names replaced by cities in India. Addr: Providence. (Frodge; Hassig; Silvi; Wolfish)

Jerry Rigged Radio- 6955 at 0130. Some of their recent rock music transmissions have been announced as low power ten watt QRP tests. Addr: Providence. (Axelrod; Haston; Jurrens; Silvi; Williams)

KOLD- 6955 at 0100. Aldo Batista, no relation to the former dictator of Cuba, is one of the few Big Band format pirates that has ever transmitted on shortwave. Addr: Stoneham. (Bill McClintock, Minneapolis, MN; Haston; Jurrens; Silvi)

KRAP- 6955 at 0200. Fred Flintstone's booming signal sends his rock music and mailbag shows throughout North America. Addr: Blue Ridge Summit. (Comeau; Frodge; Hassig; Haston; Jurrens; Love; Majewski; McIntock; Pearce; Silvi; Williams)

Lounge Lizard Radio- 6955 at 0000. Their lounge pop music comes from a different location on most shows. Recent lounges were named after *MT* columnists Glenn Hauser and George Zeller. Addr: Providence. (Ranier Brandt, Hoefler, Germany; Axelrod; Frodge; Hassig; Haston; Jurrens; Silvi)

Mystery Radio- 6955 at 0330. The distinctive new age and complex rock songs on this one make station IDs easy to fish out. Addr: Stoneham. (Jurrens; Silvi; Williams)

Not Radio Metallica- 6955 at 0100. Another parody of Dr. Tornado has emerged, with broadcasts in upper sideband. Addr: None. (Axelrod; Haston; Silvi)

Orbital Mind Control Satellite- 6955 at 2345. This old timer was formerly a rare catch, but they have been more widely heard on their recent programs with UFO themes. Addr: Belfast. (Frodge; Haston; Jurrens; Williams; Wolfish)

Radio Azteca- 6958 at 0200. Bram Stoker's clever parodies make fun of DXers and DXing, mainly from a pirate perspective. If you write in, he'll talk about you! Addr: Belfast. (Pearce; Silvi)
Radio Eclipse- 6955 at 0200. QSL's have been forthcoming from station maven Steve Mann, who uses a Johnson Viking Valiant with 150 watts for his AM broadcasts. He says that he's a regular *MT* reader. Addr: Providence. (Gary Neal, Sugar Land, TX; Brandon Artman, Westchester, PA;

Axelrod; Frodge; Hassig; Haston; Jurrens; Love; Majewski; McIntock; Morford; Prindle; Williams)

Radio Free Euphoria- 6955 at 0130. Captain Ganja's cheerful humor makes him different from the other marijuana promotion stations. Addr: Belfast. (Axelrod; Brandt; Frodge; Haston; Jurrens; Morford; Prindle; Silvi; Williams)

Radio Fusion Radio- 6955 at 0045. They are the most active pirate with rap music programming, announced as coming from the "College of Knowledge." Addr: Providence. (Hassig; Love; McIntock; Silvi)

Radio Metallica Worldwide- 6955 at 0200. Dr. Tornado's frantic activity has slowed; see above. Addr: Blue Ridge Summit. (John Arendt, Oswego, IL; Rich Barnes, Springfield, IL; Robert Pote,

Greenwood, IN; Ken Coughlin, Shelby Township, MI; Howard Espravnik, Gallatin, TN; Tony Benbenek, East Hampton, NY; Artman; Axelrod; Hassig; Haston; Jurrens; Love; Majewski; McIntock; Morford; Neal; Pearce; Prindle; Silvi; Williams; Wolfish)

Radio One- 6950 at 0000. Bobaloo remains active with his slick productions of rock oldies music. He often inserts remarks on the history of the music. Addr: Belfast. (Haston; Majewski; Morford; Silvi)

Radio Tellus- 6955 at 0300. Look for the trademark "Oh, Yeah!" and the "Earth Station" slogan from this rock music pirate. Addr: Providence. (Axelrod; Morford; Haston; Jurrens; Silvi)

Radio Three- 6955 at 2330. Sal Amoniac's parody of the other "numbered" pirates plays intentionally syrupy music from the worst of rock oldies history. Addr: None, QSL's logs in *The ACE*. (Haston; Silvi; Williams)

Radio Tornado Worldwide- 6955 at 0030. Listen carefully if you hear Metallica, since this parody uses intentionally monotonous repeated recorded phrases from the real station. Addr: None; verifying logs in *The ACE* with the QSL that we see here. (Axelrod; Brandt; Frodge; Jurrens; Majewski; Silvi; Williams; Wolfish)

Radio Two- 6955 at 1300. Yabba Dabba Do started this station as a low budget parody of Radio One, but his low key rock oldies shows are entertaining. Addr: Providence. (Silvi; Wolfish)

Radio USA- 6955 at 1400. Mr. Blue Sky has been around for 15 years with his mix of punk rock, comedy, and DX commentary, sometimes via a Metallica relay lately. Addr: Belfast. (Chris Lobdell, Stoneham, MA; Barnes; Jurrens; Williams)

Radio Wolf International- 6955 at 1300. It's been a while since this multi-pirate station has been heard. WKND, KZAP, and Radio Flattus contribute to the in-studio banter. Addr: Blue Ridge Summit. (Comeau)

Radio XANAX- 6955 at 0200. They promote (and make fun of) the Xanax tranquilizer, with a slogan of "The Relaxation Station." Addr: Stoneham. (Barnes; Brandt; Frodge; Haston; Prindle; Silvi; Williams)

Redneck Radio- 6955 at 0400. This new one broadcasts country music with a southern announcer, but not much is known about it. Addr: None. (George Zeller, Cleveland, OH; Jurrens)

Take It Easy Radio- 6955 at 1630. Another new pirate; their southern accented announcer plays rock music by the Eagles. Addr: None. (Jurrens; Prindle; Silvi; Williams; Zeller)

Up Against the Wall Radio- 6955 at 2115. Using a klaxon "oogah" horn as an interval signal, Owsley recreates the mood of the late sixties and early seventies. Addr: Providence. (Silvi)

Voice of Anarchy- 6955 at 2030. Leonard Longwire has used highly varied musical styles on his programs over the years. His latest production asked for votes on various songs for a new USA national anthem, including "The Curly Shuffle." Addr: Blue Ridge Summit. (Espravnik; Haston; Jurrens; Majewski; Silvi; Wolfish)

Voice of Hell- 6955 at 2315. They often materializes on Halloween, but St. Lucifer's devil music also made appearances this summer. Addr: None. (Haston; Jurrens)

Voice of Shortwave Radio- 6955 at 0200. Rock and parody ads, a widespread pirate format, have aired on this new one. Addr: Blue Ridge Summit. (Artman; Axelrod; Hassig; McIntock; Silvi; Williams)

WARR- 6955 at 0330. After a wait of nearly a year, Captain No Beard's marijuana advocacy station has been sending out QSL's. As promised over the air, many include a "nickel bag," which is a nickel in a plastic bag. Addr: Belfast.

(Axelrod; Frodge; Haston; Love; Majewski; McIntock; Morford; Ross; Silvi)

WBIG- 6955 at 0045. Big Mike's rock music still appears on the pirate bands. Addr: Belfast. (Majewski)

WLIS- 6955 at 0045. Jack Boggan's veteran pirate is continually active, so it's a regular in this column. Programming always consists of interval signal tunes used by international broadcasting stations. Addr: Blue Ridge Summit. (Axelrod; Comeau; Frodge; Hassig; Haston; Jurrens; Silvi; Williams)

WLS- 6955 at 0000. Somebody has been producing a tribute to this Chicago station, using original jingles from when it was a major top 40 rocker back in the 1970's. Addr: None. (Hassig; Haston; Jurrens; McIntock; Silvi; Williams; Wolfish)

WMFQ- 6955 at 2315. This one mixes rock music with chanted IDs by a group of male announcers, both in English and Spanish. It's a parody of the QSL process. Addr: Providence. (Axelrod; Frodge; Haston; Jurrens; Silvi; Wolfish)

WMPR- 6955 at 0130. Their Techno dance music has been on for years, with identifications by a male announcer and the frequency read by a woman. Addr: None. (Artman; Brandt; Espravnik; Hassig; Majewski; McIntock; Williams)

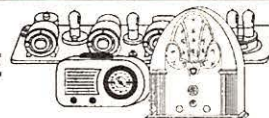
WNOT- 6955 at 0200. The Amazing Mumford's rock and roll has found an effective relay via Dr. Tornado's monster transmitter. Addr: Blue Ridge Summit. (Coughlin; Espravnik; Jurrens)

WREC- 6955 at 0030. P. J. Sparx remains among the most active North American pirates. His distinctive format mixes rock music, comedy, and parody songs to the tune of well known rock music. Addr: Belfast and Blue Ridge Summit. (Kevin Nauta, Grand Rapids, MI; Artman; Axelrod; Brandt; Frodge; Haston; Jurrens; Love; Pearce; Silvi; Williams; Wolfish)

WRFI- 6955 at 2045. This unfortunate call sign occasionally appears on the pirate bands, hopefully without interference. Rock and comedy dominate the latest version. Addr: None. (Haston)

WRKO Shortwave- 6955 at 1400. This pirate rebroadcasts rock oldies music from the licensed WRKO medium wave station in Boston. The station's interview with famous pirates Alan Weiner and Scott Becker was recently heard. Addr: Blue Ridge Summit. (Comeau; Haston; Silvi; Williams; Wolfish)

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Lectrokit SP-1 B Spider

Last month we talked about how it was possible to have a lot of hamming fun with simple, inexpensive gear. The SP-1B is a perfect example of simple fun!

The Spider can be purchased in kit form for \$49.95 or fully assembled for \$99.95; either way, it is an excellent transceiver for the QRP enthusiast.

■ The Rig

The Spider transmitter provides about 1.5 watts of RF output on 80, 40, or 30 meters. The rig is crystal-controlled using either FT-243 or HC-17 type crystals (a switch allows switching between two crystals and, of course, since the crystals plug in, they are easy to change). There is a built-in key (of decent quality) and a sidetone generator (to monitor your sending).

The receiver is truly outstanding for a rig of this price! Sensitivity and selectivity are both excellent. An optional two pole audio filter provides superb selectivity and is well worth the extra \$8.95 cost.

The receiver is automatically tuned to the frequency of the transmitter by the frequency controlling crystal; however, an RIT (receiver incremental tuning) control allows the operator to shift frequency a few hundred Hertz. (An optional variable frequency oscillator VFO will be offered soon.) I found the tuning method to be quite satisfactory and superior in many ways to a lot of the VFO rigs on the market.

All you need is a set of headphones or speaker and antenna to put this compact rig on the air.

■ The Kit

I opted to build the kit to see just what went into it and how difficult it was to build. The basic kit does not include a chassis, so unless you have one around I suggest you order one from Lectrokit at a price of \$9.95. There is a deluxe case and panel available for \$19.95, which is what I got.

When the kit arrived I was pleased to see all the components were assembled into stages and bagged individually. Components are all of the highest quality.

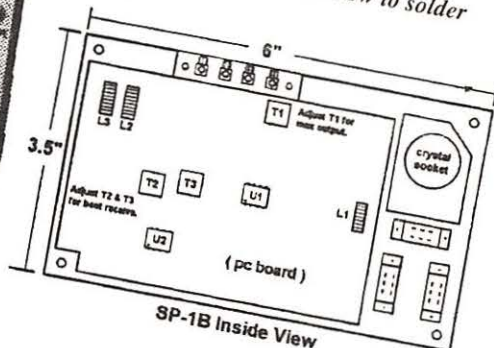
■ Building

This kit is a bit different from many of the kits available today in that the pc board is not marked (i.e., silk screened with the part numbers). Instead, the pcb (pc board) is laid out in



The receiver is truly outstanding for a rig of this price!

I would say this kit can be built successfully by the first time kit builder without help (provided the person knows how to solder properly).



grids (on a drawing) and parts are compared to the drawing (which is very precise and of excellent quality).

I found this method preferable to the pc labeling many kit manufacturers use, as it provides an accurate double-check of every component. Too many pc boards today are poorly labeled, making it difficult to tell exactly which component goes where and how it goes. If you are a first time kit builder this technique may be a bit more difficult to follow initially, but once it is understood you will like it.

I would say this kit can be built successfully by the first time kit builder without help (provided the person knows how to solder properly).

An experienced builder will put this kit together in four or five hours; the novice may require double that time. There are no tricky jobs involved with building the Spider as Lectrokit provides excellent detailed plans and explanations.

The Spider can be built for 80, 40, or 30 meters. I choose 40, as I had a lot of crystals on hand for that band. The manufacturer provides all components to put the unit on the band of your choice.

My kit went together in a single weekend and was on the air that same weekend. Using a 33 foot long Marconi antenna, stations were worked out to about 500 miles with ease. Signal reports ranged from 599 to 339. Coupled to my 40 meter dipole I was able to work several stations in the western USA, including Arizona, Texas, Washington, and Colorado.

Initially I used the Spider without the optional two pole audio filter and found some

difficulty copying stations through the QRM, but upon adding the filter it was a totally different story; QRM was no longer a problem and signals popped right out of the noise. The two pole filter cost \$8.95 and is well worth the price. It can be built and installed in an hour or so.

Crystals for your Spider can be obtained from several sources. If you decide to purchase a kit you might want to write to crystal suppliers at the same time and order several for the band you choose. The two best companies would be Petersen Radio Company at 2735 Avenue A, Council Bluffs, IA 51501; phone 712 323-7539, and CW Crystals 570 N. Buffalo St, Marshfield, MO 65706.

I might also add that, if you choose not to use Lectrokit's case, they provide you with the Radio Shack part number for the preferred metal case.

The Spider is available from Lectrokit, 401 W. Bogart Rd., Sandusky, Ohio 44870; price is \$49.95 (kit) or \$99.95 wired and tested; shipping/handling is an extra \$5. A ten watt model of the Spider is also available for only \$59.00 plus \$5 s/h.

Cases are \$9.95 for the basic unit and \$19.95 for a silk screened case and panel. There is also an antenna tuner kit available at a price of \$37.00 plus \$5 s/h.

Write for their complete catalog and information sheets.

If you are looking for a fun rig, either assembled or in kit form, the Spider deserves your consideration. I like mine a lot and use it almost daily.

Once more we have run out of space; keep the letters and cards coming.

SPECIAL EVENT CALENDAR

October 4 - 26

10-Metre Meteor Scatter Test

Sponsored by the Ontario DX Association. Dates: Saturday, October 4 to Sunday, October 26. Time: 0900-1100 UTC. The ODXA will conduct meteor scatter tests on 10 metres (29.050 MHz) each Saturday and Sunday morning throughout October. Mainly CW. We are seeking signal reports from anyone who hears our signal. We will use standard meteor scatter procedure: 15 seconds transmit followed by 15 seconds receive. We will transmit the first and third 15-second interval each minute. Callsign will be VE3ACK and transmission will be "CQ VE3ACK." We will respond to stations replying to our CQ. Send signal reports to Philip Gebhardt, VA3ACK, P.O. Box 52, Greenbank, ON, L0C 1B0 or to pgebhardt@compuserve.com. For further information or updates on the experiment, visit the ODXA web site at <http://www.grove.net/~odxa/>

October 5

Queens, NY

Hall of Science ARC / PO Box 131, Jamaica, NY 11415; Arnie Schiffman WB2YXB (718)343-0172 (evenings only). Location: NY Hall of Science parking lot - Flushing Meadow Park, 47-01 111th St, free parking; Talk-in 444.200rptr, 146.52simp.9am-3pm, adm \$5.

October 10 - 12

Canadian Int'l DX Club

35th Anniversary convention (new dates!). Contact CIDX Vice-president Mickey Delmage, Edmonton, Alberta 403-450-2231, cidxqsl@freenet.edmonton.ab.ca for more info.

October 12

Lincroft, NJ

NJ State Conv, Shore Area Hamfest / PO Box 635, Eatontown, NJ 07724, Al Jackson NK2O (908) 922-8121. Location: Brookdale Community College, GS Pkwy ex-109, W on Rt 520. Talk-in 145.485/-6. Opens 8am (breakfast 7:30). Adm \$6

Bethpage, NY

Long Island Mobile ARC (LIMRC) / Diane Ortiz, K2DO, LIMARC, P.O. Box 392, Levittown, NY 11756, (516)520-9311, LIMARC73@aol.com, www.aol.com/RaySk/LIMARC1.HTML Location: Briarcliffe College, 1055 Stewart Avenue, Bethpage. Talk-in 146.85 (136.5 PL) Admission 8:30am-2pm, \$6.

October 26 - November 2

Contest for European DXers

CORAD: Tropical Country Radio 1997, Memorial Berhnhard Gruendl contest. Research contest to help DXers who are unable to listen regularly at night. For information on listening times and targets, contact Marco CERRUTI, P.O. Box 146, 13100 VERCELLI, ITALY

October 26

Sellersville, PA

RH Hill ARC / Linda Erdman KA3TJZ (215) 679-5764, 2220 Hill Rd, Perkiomenville, PA 18074. Location: newly rebuilt Sellersville Fire House, Rt 152, 5 mi. south of Quakertown, 8 mi north of Montgomeryville. Talk-in 145.31. VE testing 10am-1pm, all classes, bring documents; Admission \$5.

CLUB CIRCUIT

North American Club Listings C - F

Capitol Hill Monitors: Alan Henney, 6912 Prince Georges Ave, Takoma Park, MD 20912-5414, (301) 270-2531/5774 fax. DC, MD, No.VA, So.DE. Scanner bands. Frequency Forum BBS 703-207-9622 (8-N-1) Capitol Hill Monitor. \$10. Meets irregularly.

Central Florida Listeners Group: Mark Kuziv, KC4ZVK, 3217 St. Augustine Ct., Kissimmee, FL 34746 (407) 933-7163, kuziv@magicnet.net. Central Florida; All bands. Net on 146.820 MHz Sun 8 pm. Conference #10 on Laser BBS (407) 647-0031 or Bullwinkle's Corner BBS (407) 896-5772.

Central Indiana Shortwave Club: Steve Hammer, 2517 E. DePauw Road, Indianapolis, IN 46227-4404. Central Indiana; SW broadcast-ing, pirates, and the offbeat. Shortwave Oddities.

Central VA Radio Enthusiasts: Richard Rowland, POB 34832, Richmond, VA 23234-0832. Metro Richmond and vicinity. VHF/UHF. SASE. No newsletter, no dues. Meets quarterly in Richmond.

Chicago Area DX Club: Edward G. Stroh, 53 Arrowhead Dr., Thornton, IL 60476. 300 mile radius of Chicago; DXing all bands. DX Chicago. \$17, \$1 sample. Meets irregularly.

Club d'ondes courtes du Quebec: Dominique Duplessis, 5120 35 eme rue, Grande-Mere, Quebec, Canada, G9T 3N6; e-mail dduplessis@infoteck.qc.ca; <http://www.infobahnos.com/~pedro>. Annual \$40 Canadian. L'Onde, monthly (French). Sample US\$2.

Chicago Area Radio Monitoring Association (CARMA): Ted & Kim Moran, Box 2681, Glenview, IL 60025, (630) 612-0609 fax. Chicago & midwest. Public safety & general coverage. CARMA BBS (630)852-1292. CARMA Newsletter. Meetings (Sats) and newsletter bi-monthly on alternate months.

Communications Research Group: Scott Miller, 122, Greenbriar Drive, Sun Prairie, WI 53590-1706. Wisconsin area. Scanning.

DecalcoMania: Paul Richards, P.O. Box 126, Lincroft, NJ 07738, (908)591-2522. Worldwide AM, FM and collecting radio related items. DecalcoMania. \$9 US, \$10 Can/Mex, \$15 Eur, \$16 Asia/Pac. Email: DecalMania@aol.com

Delaware County (PA) Emergency Radio Club: David A. Donohue, 610.493.0292 DDONOHUE@bigfoot.com. Scanning public safety in Delaware, Philadelphia, Buck, and Chester counties. Monthly meetings and online newsletter www.tripod.com/~ddonohue/ DCERC.HTM - \$5 dues.

DX Audio Service (National Radio Club): Ken Chatterton, P.O. Box 164, Mannsville, NY 13661-0164, (315) 387-3583; <http://wcoil.com/~gnbc>. Worldwide. North American Broadcasters. DX-Audio Service (90-min.tape). Sample \$3.

Fire Net: Tom Kravitz, Box 1307, Culver City, CA 90232, 310-838-1436, internet mpage@netcom.com. All of California; fire, EMS, tied in with nationwide notification net.

Fire Notification Network of Michigan: Garry Watts, PO Box 1312, Warren, MI, 48090-1312, (810) 772-4423; firenet@usa.net. Michigan alphanumeric pager net, breaking news via text pager. Customizable Michigan and national options available.

Send announcements or club information to: Editor, Monitoring Times, P.O. Box 98, Brasstown, NC 28902-0098. Fax 704-837-2216, mteditor@grove.net. See www.grove.net/mtclubs.html for listing of North American and international clubs or send an SASE to Clublist, at address above. See ARRL's web site at <http://www.arrl.org/hamfests.html> for full hamfest calendar.

Feed-line Tips and Equipment Protection

Some shortwave enthusiasts I have known have a casual outlook about antennas, feed lines, and protection devices for their station equipment. Their principal focus seems to be centered on erecting a dipole or end-fed wire and hooking a receiver to it. Upon asking a few questions I learned that many of the basic practices for station efficiency and equipment safety were unknown to these SWLs.

This month we will consider some fundamental procedures that might make your listening post more effective while providing protection for your receivers and accessory gear.

■ Old versus New Coaxial Cable

Signal losses occur even in new coaxial cable. The losses in dB (decibels) are proportional to the type of coax, the insulation used within it, the operating frequency and the length of the feed line. It is to your advantage to minimize these losses so that weak signals will travel from your antenna to your receiver with the least reduction in strength.

RG-8 coax is less lossy per 100 feet than RG-58. However, RG-8 is bulkier and more difficult to route into the house. A newer and less lossy coax cable has become more popular than RG-8 in recent years. It is identified as RG-213. If you prefer a modern low-loss 50-ohm coaxial cable that is only slightly larger in diameter than RG-58 (similar in size to RG-59), you may use RG-8X. It is relatively inexpensive and very flexible.

Beware of bargain coaxial cable or cable that is known to be many years old. Coax cable that has been out of doors for several years is usually in poor condition. This results from UV radiation and airborne chemicals contaminating the vinyl outer jacket of the coax and allowing the byproduct to leach into the inner insulation of the cable. This makes it lossy.

Moisture leaking into the cable along the shield braid and outer jacket, over time, will also cause the coax to become contaminated and lossy. You can prevent moisture from entering your coax cable by using a putty-like substance called Coax Seal. Coax connectors that are used out of doors should be sealed with this compound. Likewise at the points where the cables mate with the coax connec-



tors.¹

It is wise to use new coaxial cable, or some of known quality that you may have on hand. When purchasing new coax make sure the outer conductor (shield braid) does not consist of only a few woven strands of copper. The braid should have numerous small copper wires woven into a tight mesh that obscures the inner insulation of the cable when you expose the shield braid. The better the integrity of the braid the more effective its shielding ability.

Losses per 100 feet for each popular type of coaxial cable, versus frequency, are listed in *The ARRL Antenna Book*.² It is important to remember that a 3-dB loss through a given length of coax cable when receiving a signal is equivalent to the transmitter at the other end of the line cutting its power in half. Therefore, the greater the feed-line loss, the weaker will be that DX signal you are trying to copy. Keep the coaxial feed line to your antenna as short as practicable. This is especially important at VHF and UHF, where feed-line losses are always the highest.

■ Can I Bury Coaxial Cable?

It is sometimes desirable to bury the coaxial feed line between the antenna and the

house. The question is frequently asked, "Will it hurt to bury the feed line?" This deserves a "yes" and "no" answer. Never bury ordinary coax, such as RG-58, RG-8, RG-8X, or RG-213 in the soil. Most locations have acid and alkaline components in the ground. These chemicals will quickly contaminate and ruin coaxial cable.

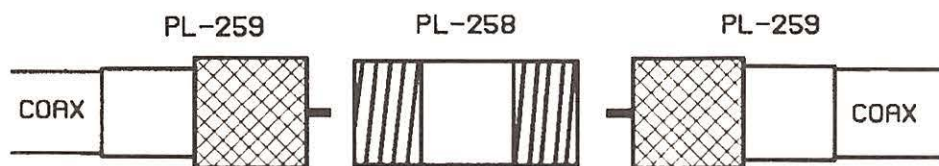
But "yes," there are 50-ohm, RG-8 size cables made especially for in-ground installation. These cables are impregnated with a sticky substance that prevents moisture from entering the cable. Also, the outer jackets are made of tough chemical/moisture-resistant polyethylene material. Designators for these cables are Impervon (Times Wire & Cable Co.), VB-8 (Decibel Products Corp.), and Bury-8. The latter is available from the supplier listed in note 1.

■ Checking for Cable Loss

If you question the quality of your coaxial feed line, especially if it has been out of doors



FIGURE 1 — Examples of lightning arrestors for use in coaxial feed lines. The upper one contains a gas discharge tube (see text).



PROPER COAX SPLICE

FIGURE 2 — Illustration of the correct way to join odd lengths of coaxial cable.

for two or more years, you can use a transmitter, a 50-ohm resistive load, and an RF power meter to make a test. You do not need to have an FCC license to transmit into a dummy antenna.

First, place the RF power meter at the transmitter output jack. Connect the 50-ohm dummy antenna to the far end of the coax to be tested. Connect the remaining end to the power meter. Turn on the transmitter and note the power reading in watts (W1). Next move the power meter to the far end of the coax, just ahead of the dummy antenna. Transmit and note the RF power reading (W2).

Subtract W2 from W1. This will reveal the line loss in watts. Watts may be converted to dB by using $\text{dB} = 10 \times \log \text{ of } (W1/W2)$. Thus, if you have 100 watts at the transmitter end of the coax line, but only 35 watts at the far end of the coax line, the loss is 4.56 dB.

■ Equipment Protection

We must always be mindful of the hazards of lightning with respect to our radio equipment. My practice is to disconnect the antennas and unhook my station equipment from the AC power outlet if a storm is forecast. Also, I use surge protectors between my equipment and the AC outlets. The modem in my computer is protected by a surge suppressor between it and the phone line. I always unplug the phone line from the computer when a storm is expected, just to be sure that no equipment damage occurs. AC line surge suppressors are available in various models at computer supply stores.

Devices are available to protect receivers from lightning energy. Figure 1 shows two lightning arrestors sold by Cushcraft Corp. They are available from Amateur Electronic Supply.³ The upper arrestor contains a fast acting gas discharge tube which protects your equipment from surges up to 5000 amperes. It fires within 100 nanoseconds in the presence of 50 volts or less.

The lower unit is known as a Blitz Bug lightning arrestor. I do not have performance specifications for this model. These arrestors are installed in series with the coaxial feed line. Their cases must be connected to a qual-

ity earth ground. An excellent article that describes the nature of lightning and how it is generated was written by F. O'Driscoll. It appeared on page 8 of June 1997 *MT*.

■ Splicing Coaxial Cable

Sometimes it is necessary to join odd lengths of coaxial cable to provide sufficient feed-line length between the antenna and the station. I have seen examples where the user simply soldered the inner conductors together, wrapped the junction with electrical tape, then soldered the shield braids together and added more tape. Although this may be an acceptable temporary expedient, the opportunity for water to enter the cable is significant. Also, splices of this type weaken the cable. The inner and outer conductors of the cable can easily pull apart in the presence of wind,

or just from the weight of the cable.

The proper way to join sections of coax cable is to use PL-259 male connectors at the ends of the coax where the splice is to be made. A PL-258 female coax union or "barrel" connector is installed between the two PL-259 connectors (figure 2). Coax Seal may then be used to cover and protect the connectors from moisture and corrosion. The three connectors can be purchased for roughly \$2 from the vendor in note 1.

■ Closing Comments

A quality earth ground for lightning protection can be made by driving four 6-foot copper rods in the ground and bonding them together with shield braid from RG-8 coax cable. Ideally, the braid would be soldered to each rod. The four rods should be spaced at least four feet from one another. Additional shield braid may be used from the ground system to the case of your lightning arrestor.

■ Notes

- 1 — The Radio Works, Box 6159, Portsmouth, VA 23703. Phone: 1-800-280-8327 to order.
- 2 — The ARRL, Inc., 225 Main Street, Newington, CT 06111-1494
- 3 — Amateur Electronic Supply, Inc., 5710 W. Good Hope Rd., Milwaukee, WI 53223. Phone: 1-800-558-0411 to order.

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Windshear: The Unseen Enemy

Have you ever wondered just what approach controllers are talking about when they advise pilots that "low-level windshear has been reported on the field"? Let's examine this weather phenomenon and why it's so dangerous to aircraft landing and taking off during storms.

Most meteorologists define windshear as "any sudden change in wind speed, wind direction, or both." Windshears are created by air flowing over rough terrain, by warm air currents rising from sun-heated ground, by the collision of air masses of different temperatures and moisture content, and by thunderstorms. Most have no effect on airborne planes. Some, referred to as turbulence, are felt by passengers as bumpiness. So wind shear is a common occurrence.

The National Center for Atmospheric Research, together with other scientists, conducted field experiments and determined that a wind shear called a "microburst" is responsible for aircraft accidents on take-offs and landings. Microbursts are produced when a rain shower or thunderstorm creates a current of rapidly downward moving air — a downdraft — that spreads out horizontally in a starburst pattern when it strikes the ground, just as water from a faucet spreads out when it hits a sink.

Windshear endangers planes for the following reason. Once a plane hits a microburst, it encounters an increase in head winds radiating away from the center of the downdraft. This increase in head winds enhances the airflow over the plane's wings, causing the plane to pitch upward and forcing the pilot to compensate by reducing engine power. Then, as the plane passes through the downdraft center, the head wind rapidly decreases and becomes a tail wind, and the airflow over the wings suddenly falls off, with a corresponding decrease in lift (see illustration).

Any additional loss of airspeed, caused by the pilot reducing engine power and/or the downdraft of air pushing the plane toward the ground, contributes further to this hazardous situation. If the aircraft is too close to the ground when this happens, there may not be enough time for the pilot to react and for the engines to regain sufficient power to compensate for the loss in airspeed. This is the likely sequence of events which led to the crash of Clipper (Pan Am) flight 759 during takeoff

from New Orleans in 1982, as well as the Delta crash during landing at Dallas-Ft. Worth in 1985, and countless other weather-related aviation accidents through the years.

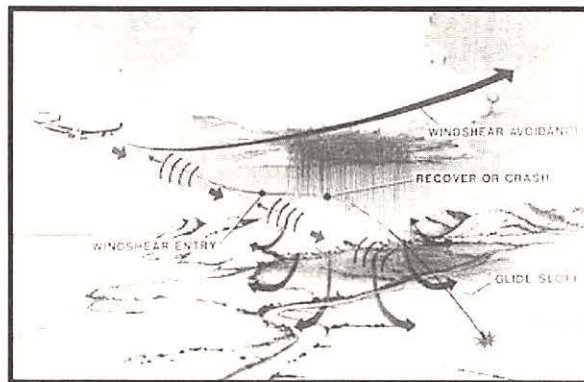
Microbursts are seasonal. They are associated with thunderstorms and rain showers and occur — but are not limited to — spring and summer, or whenever such storms take place locally. Because precipitation is important in the production of a downdraft, microbursts are always associated with a precipitation cloud. The rain need never actually reach the ground, however. In the dry climates of the western states, rain may evaporate completely before it reaches ground level, yet still produce a strong microburst.

These above ground-level showers are a particular threat to aircraft, because the precipitating cloud looks innocent and the pilot may be caught completely unaware. This is what happened on 31 May 1984 when a United Airlines jet was taking off from Stapleton Airport in Denver. The plane was departing during a seemingly benign shower in which only a few raindrops reached the ground. But, just as the plane was lifting off the runway, it penetrated a microburst and lost about twenty-five miles per hour of airspeed.

The aircraft was only about ten feet off the ground and eleven hundred feet beyond the end of the runway when the fuselage was punctured in three places by an antenna on the ground. The plane then moved out of the microburst and rapidly gained altitude but had to return to the airport because the holes in the fuselage made it impossible to pressurize the cabin.

An almost certain disaster was narrowly averted because the pilot used a recently developed microburst flying procedure that involved pitching the plane up while moving at a low speed. However, this procedure does not mean that pilots can now safely fly through microbursts. If the tail wind had been only slightly stronger, a crash would have been unavoidable.

Analysis of data from field experiments indicates that the average microburst lasts only ten to twenty minutes, that the typical



wind shear immediately following the downdraft hitting the ground is twenty-seven miles per hour, and that windshear increases to fifty-six miles per hour from five to ten minutes after initial impact and then decreases rapidly. Because of the small size and short lifetime of a microburst, existing wind-measuring systems at airports are frequently unable to detect microburst winds in time to warn aircraft.

Low-Level Wind Shear Alert Systems (LLWSAS) have been installed at over 110 major airports across the country and have proven to be of at least some value. Meanwhile, research is continuing to upgrade and improve their usefulness. For example, during the next several years a procedure is expected to evolve that will provide warnings of wind shears and other hazardous weather conditions to most major airports. This system will be based on new Doppler radars and will be capable of estimating wind speeds and direction every 200 to 300 feet within a fifty-mile radius.

Since not all airports are equipped with Doppler radar systems, the FAA mandated that all commercial aircraft must have onboard windshear detection or prediction systems. Airborne sensors may include a microwave radar sensor, a laser system called Doppler LIDAR (light detecting and ranging), and an infrared detector.

The primary task ahead is to develop improved computer models that will rapidly extract wind shear and weather information from radar and other instrument data and communicate it in a concise, informative manner to pilots and controllers as quickly as possible.

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144	600-B 0	32144	300-0 8		
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2600	600-C 121	32144	p 300-0 372		
144	32144	32144	p 300-0 355		
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"Privatizing" Federal Communications

If Congress has its way, the federal government communications systems will go semi-commercial in the near future. Here is the abbreviated text of Mr. Larry Irving, who is the Assistant Secretary for Communications and Information, National Telecommunications and Information Administration (NTIA), in his testimony before the U.S. Department of Commerce. The hearing was on the Fiscal Year 1998 NTIA appropriations before the Subcommittee on Commerce, Justice, the Judiciary, and Related Agencies on Appropriations, House of Representatives on March 13, 1997.

■ Spectrum Efficiency:

The Federal Government constantly seeks to modernize its radio communications, decrease the channel bandwidths, and increase its use of new technologies. These are some of the management tools we use....

Federal government users must use commercial services when possible...NTIA requires that every government user requesting a frequency assignment must first determine that their needs cannot be met by a private or commercially available service provider. This policy, contained in NTIA regulations, has resulted in increased use of commercial services by government users. For example, the Department of Defense has increased its use of commercial satellite services, and many agencies are using **Commercial Land Mobile Services** (emphasis mine).

In 1993, the Secretary of Commerce submitted the Land Mobile Spectrum Efficiency Plan to Congress, as required by the NTIA Organization Act. The implementation of this plan resulted in:

1. More use of commercial and government owned trunking systems
2. Doubling the channels in three major federal land mobile bands through new narrow band technology, and
3. The promotion of sharing with the private sector.

Only recently has the private sector adopted a narrow band channel plan.

Thanks to Jim Conrad for finding this and submitting it to the FedCom mailer.

As we have been saying for the past year or so, there is less and less federal activity on federal channels. We have been receiving

sporadic reports of federal agencies showing up on commercial trunking systems. It looks like we might be seeing more of this in the future. I think it will be a while before we find the FBI and the DEA sharing trunking time with the local pizza delivery company or the pool contractor, but if the NTIA has its way, this could be the wave of the future. Start buying those Uniden Trunk-Trackers now before they are all gone.

■ Reader Input

- We have received our first item of Trunk-Tracker information concerning a federal system. This was on the FedCom mailer and was submitted by Bruce Varine regarding the FBI out in Portland, Oregon. Bruce writes that the local FBI is on the local 800 MHz trunked system and is using talk group 16528. Bruce goes on to say that the U.S. Marshal is also to be found on that system. Bruce has an e-mail address of "WitchDr@usa.net" if you want more information on the system.

I'll bet if we look very closely into our local police and commercial SMR systems, we will find more of the above throughout the country.

- From information on the Scan-L mailer, it seems that Garden City, New Jersey, has the local DEA on its 800 MHz trunked system. They did not provide any talk groups or frequencies. Information please? Garden City uses an old Type 1 system, so apparently the first fleet map in the book will work, but we need specifics.

- One of the contributors to the Scan-L, who wished to remain anonymous, has just finished up working on the DEA radios. He says that apparently DEA has standardized its radio system nationwide on their UHF channels. Here is the current standard plan:

Channel	Out/Input
01	418.625/416.050
02	418.900/416.325
03	418.750--simplex
04	418.675--simplex
05	418.825/415.600
06	418.950/416.200
07	418.975/417.025
08	418.975--simplex

This frequency plan is apparently good throughout this hemisphere. Numerous reports have come in from Mexico and South America where 418.625 MHz is the main

channel operating from the DEA headquarters in the American Embassy. The sub-audible tone is 156.7 Hz.

- Last month we had several submissions from the Washington, D.C. area. A reader who wishes to remain anonymous did some camping in the Catoctin Mountain National Park. For those of us who did not know, this is where Camp David is located. He stated that interesting conversations have been monitored on not only the Secret Service "Delta" frequency of 169.925 MHz (which is used by the Marine Corps guards), but also on the Park Ranger repeater for the national park. The frequency for this system is 171.725 MHz output with 172.525 MHz input. The subaudible tone is 141.3 MHz.

- Over in Maryland there is some serious monitoring going on. I say this with tongue in cheek because this is the home of the National Security Agency—the home of the "Big Base-ment." The NSA headquarters are located on the grounds of Ft. Meade Army Post. Ft. Meade has recently gone to a trunked system. Their output frequencies are:

406.325
407.400
407.575
409.450

- It seems the National Security Agency has set up its own trunked system. They are using the following output frequencies:

408.150
408.625
409.525
410.275

The only thing monitored is administrative type traffic and the system is a low power one. Do not look for the latest CNN headline story to be broadcast on this system first.

- A mystery frequency of 414.225 MHz has been showing up in the Washington/Baltimore area. It has a subaudible tone of 167.9 Hz with it. This tone is used by the FBI in its radios. The reporter says that it sounds like a Motorola Intrac data system, but it is on the air constantly.

A check of the data base shows that this frequency is assigned throughout the State of Maryland for law enforcement mobiles only. It seems the DEA is also authorized to use this frequency in Washington and identifies it by the call sign "WDL."

It was used up until a couple of years ago by the DEA/ATF Task Force Group 34 which operated from a building on 7th. Street SW.

They moved their operations to a Pennsylvania Avenue location in Maryland between the Beltway and the DC line. They also used 419.275 MHz along with the normal DEA frequencies (mentioned elsewhere in this article) for surveillance.

■ Data Delivery on 142.925

There is telemetry being monitored on 142.925 MHz in the Washington area. It is similar to the weather data which is transmitted on 163.35 MHz. Similar data is being heard on 139.650 MHz.

There are two (or more) possible answers for these signals. The first is they could be coming from Silver Springs. FEMA has a disaster network for Region 3 which is based at Olney, with the callsign of KPS303. It is possible they are relaying weather data from the 163.350 net.

The 139.650 MHz signal is used almost nationwide by the Air Force. It carries special energy utility conservation telemetry networks. They use multiple receivers in the system to control electricity to selected sites on the bases. The system at Andrews Air Force Base is rated at 90 watts and the sites at Ft. Myer, Ft. Lee, and Langley are rated at 60 watts. You can monitor the civilian equivalent on the frequency of 154.45625 MHz.

■ FCC Rides in Style

One of our faithful monitors, Ken Wyatt, of Colorado, sent in a submission to the Fedcom mailer regarding the FCC monitoring vehicles in use. He had seen the latest vehicles in use out of the Denver Field Office and passed along the following information.

The vehicles are late model Ford Explorers with heavily tinted windows. The entire cargo area in the rear of the vehicle is full of equipment.

A two foot diameter hole is cut out of the center of the roof. There a fiberglass antenna which is vertically polarized but horizontal in structure is installed. It consists of 36 radials. It is then covered in another layer of fiberglass which is flush with the remaining metal roof. The entire works is then body-puttied around the edge and the roof is repainted to match the body color.

The external antennas include a disguise broadcast, which covers the VHF communications, the DF antenna built into the roof (mentioned above), a GPS receive antenna also built into the roof, two cellphone antennas, and a UHF look-alike scanner receive antenna. The communications on the vehicle include VHF on 167.050 MHz and encrypted cellphone capability.

The receivers on board include a programmable AOR 3000 scanner and a Watkins-Johnson

"black-box" receiver. This is an interesting short-wave receiver. It is essentially a black box. It is completely computer-controlled and has no external knobs. Price is in the 30,000 dollar range. There is a remote controlled spectrum analyzer and a couple of PC computers with touchscreens which have a console mounted display. They run the receivers and the spectrum analyzer. There is also a multi-mode television receiver on each vehicle.

Each mobile unit includes a separate hard drive on one of the computers with the entire map of the United States linked to their GPS system. The GPS is controlled by one PC and the Watkins-Johnson receiver and spectrum analyzer is controlled by the other PC. Everything is recorded on 1/2 inch video tape on a VHS recorder in data format for replaying back at the office.

A source tells me that there are twelve to fifteen of these vehicles located throughout the United States, with the majority being in major monitoring locations. They had been using large, late model sedans with dark windows, but it seems they needed more space for the additional equipment and vans draw attention—so they went to the Explorers.

■ Custom-ary Frequencies

I keep getting mail that Customs has a new frequency of 165.235 MHz. This is not correct. Some of the scanners will not allow the fourth decimal place to be entered. The actual frequency was, and still is, 165.2375 MHz.

While we are discussing Customs, it seems they have gotten sneaky on us and are using the frequency of 163.250 MHz for simplex surveillance operations in some areas. The frequency of 163.250 is a nationwide hospital paging frequency. Customs is using it in some areas

where they will not bother hospital paging by their operations.

This brings up another point. With all of the two-way radios out there now either being "dial up the frequency" or PC synthesized, a lot of law enforcement agencies—local, state, and federal—have discovered the paging channels. It appears the nationwide paging channels are being programmed into their two-way radios. They use these channels for low power tactical operations. If they can find an unused channel in their area, they have a new frequency to use. I don't know how it is in your area, but the 454 MHz band has a lot of unused frequencies in it here in South Florida. Might be a good place to look.

A New York City source, who has proven reliable in the past, sent me the following:

New York City Customs Band Plan

Channel	Output	Input
01	165.2375	Simplex
02	165.2375	166.4375
03	166.4625	Simplex
04	165.4875	166.5625
05	165.4875	Simplex
06	166.1250	Simplex
07	165.4625	166.5875
08	165.4625	Simplex

There is some traffic noted on 169.450 MHz, but the signal is weak in his area of New York City.

■ New E-Mail address

I have a new e-mail address. You may reach me at JOHNFO413@AOL.COM. (That is a number zero after the JOHNF, not a letter o.) Let's see some Federal trunking information coming in. See you online.



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Satellite Radio For Your Car

If you ask many Americans, they might say the right to drive a car is covered in the first ten amendments to the U. S. Constitution. Hundreds of millions of vehicles cram our highways every day. Millions more lie in tens of thousands of rusting auto graveyards, and still millions more are rolling out of Detroit and steaming over from across the seas. One of the few things that can top our consumption of cars might be our consumption of radios.

Happily, nearly every car in this country has a radio of some sort in it and most have cassette tape players. In a move to add even more entertainment to our driving, built-in CD players are now standard equipment on luxury models with add-ons widely available at decreasing prices. Is there no end to our need to be distracted from the road?

Maybe... The final word on in-car audio entertainment is just about to dawn and its debut may be even more auspicious than that of small dish satellite TV.

The FCC calls it the Digital Audio Radio Service (DARS), but you'll call it satellite radio—the best thing you've ever heard in your car. Last April the FCC awarded the only two licenses it will issue for the service to CD Radio, Inc. and American Mobile Radio Corp. (AMRC). The two bought the rights to use this part of the spectrum by plunking down \$83 million and \$89 million respectively. Industry sources believe this to be a very cheap price for an industry which figures to gross over a billion dollars per year just a few short years after launch.

■ Satellite Radio History

The deadline for applying for FCC approval for the DARS was in 1992. Surprisingly, only four companies came forward. However, it took five years to award the licenses due to wrangling among FCC commissioners and a steady stream of objections from the terrestrial radio broadcast industry headed by the National Association of Broadcasters. The number of licenses was limited to two, because the band they'll be operating in

(2.3 GHz S-band) is very narrow and will only support two competitors. The two highest bids, CD Radio and AMRC, won.

Neither company was exactly dozing in the five year interim that it took the FCC to get in gear. Both are building satellites and developing production models of their respective receiving equipment. The interesting thing about the receivers is that the FCC has required they be compatible with each other (doubtless remembering the Beta vs. VHS contest) so that customers may switch between services without having to buy new receivers. My guess is that the services will be

as 200 miles from U.S. coasts. Customers include shipping companies which deal with maritime, air, and land transportation.

AMSC provides seamless communications between satellite and land based transmission modes. They will fly two satellites in the 2.3 GHz band for their DARS at 85 degrees and 110 degrees west.

CD Radio has pioneered many of the technical aspects of digital radio and has brought some innovative technology to the service. Their novel 2" diameter flat antenna sends the down-converted satellite signal to the in-dash receiver via a miniature transmitter operating at 900 MHz. Since the programming is sent via a highspeed data stream there's no loss in the extra transmission hop.

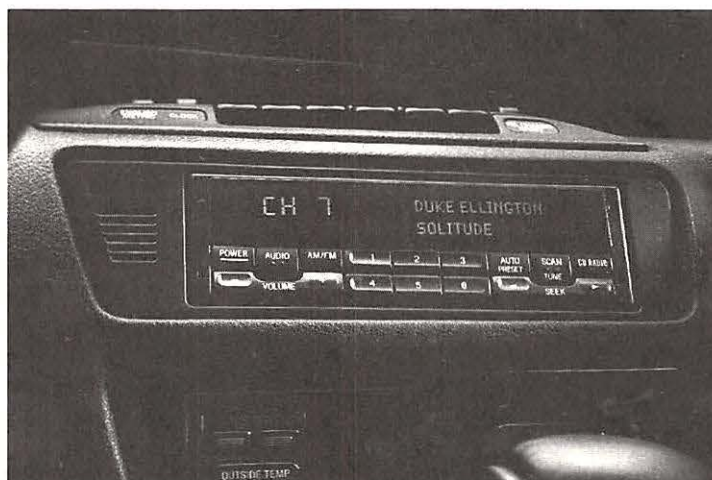
CD Radio will fly its two S-band birds at 80 degrees and 110 degrees west.

■ Programming

Both DARS providers plan to use similar digital compression technology to deliver the CD quality audio that makes this service so appealing. While AMRC has yet to release its programming plans, CD Radio says it will offer 50 channels of audio programming. 30 channels will be formatted music similar to that currently found on terrestrial audio satellite broadcasters

DMX and Music Choice (see chart). In addition, CD radio plans to have 20 channels of sports, news, and talk-show formats. Industry sources say that these additional 20 channels may be advertising supported.

CD Radio won't rely on other established networks or services to provide their programming. They plan to initiate all of their programming including the talk channels. CD Radio Chairman and CEO David Margolese says "...We plan to ...construct our national broadcast studio, a superstudio housing 50 radio stations under one roof, in the talent-rich environment of New York..." He sees his satellite radio delivered programming source becoming as pervasive in radio as cable is to television.

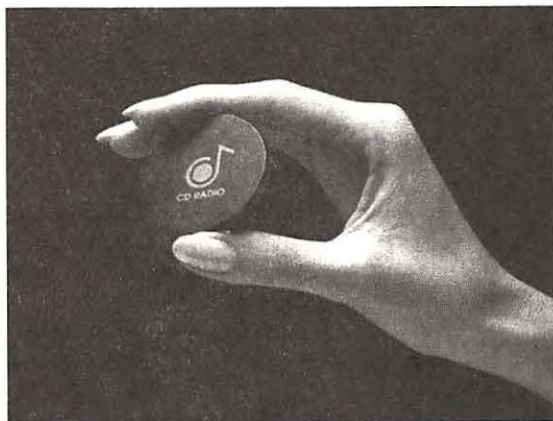


CD Radio plans to change the way you hear music in your car. Not only will you get great CD quality music, but the selection currently playing will be displayed on an digital read-out screen. The receiver will cost an estimated \$150 more to include the satellite band. (Courtesy CD Radio, Inc.)

nearly identical *a la* DirecTV and DISH, and that the only differences may be in billing schemes.

■ The Players

Both companies have a claim to promote. AMRC is a division of American Mobile Satellite Corp.(AMSC), a company which provides satellite delivered data, voice, and paging services to the transportation industry. AMRC has been operating its L-band Hughes-built satellite, in geosynchronous orbit at 101 degrees west, since its launch two or more years ago. It provides voice, high speed data, and facsimile services to customers all over the U.S., including Puerto Rico, and out as far



Don't throw that little plastic chip away! That's your satellite antenna, downconverter, and 900 MHz wireless relay to your in-dash satellite receiver. (Courtesy CD Radio, Inc.)

While AMRC hasn't announced details of their receiving equipment or subscription plans, CD Radio plans to offer their services on a subscription basis for around \$10 per month. They expect to sell most of their units in rural areas where radio programming is more sparse.

■ Money in the Bank

Any way you slice it, the numbers appear to be there. By the turn of the century, industry sources predict there could be as many as 100 million DARS units in service. That would make it a \$1 billion per month industry, far outstripping the success of the DBS satellite service, which after three years has only 7 million subscribers.

But, before you get a second mortgage for your house in order to cash in on this latest electronic bonanza, you should know there are a few possible pitfalls. Not the least of these is that the satellite may never get off the ground. There is always a chance of a failure at launch. Once launched, there's no guarantee the satellite will prove operational. More than one satellite has failed to achieve geosynchronous orbit for reasons still not understood. Once in orbit and operational, there's still the chance of a Telstar 401 type catastrophe in which the bird stops operating and ground controllers can only speculate on the cause.

Add to these scenarios the possible technical problems which might make listening to this service more than annoying. These proposed satellites put out a whopping signal, which partly explains why a 2" antenna will work. But, satellite signals still rely on "line-of-sight" reception. You must literally be able to see the satellite—no obstructions in the way—in order for the signal to reach the

antenna. Given the physics of planetary structure, the further north on the planet you travel the lower the look angle and the more chance there will be something interfering with your signal.

What about that big truck next to you on the Interstate, what about traveling through mountainous states or in built-up suburban areas? Center-city urban areas? Tree shrouded country roads? What about rain-fade and snow cover? What will happen to the in-dash satellite receiver the first time you key up your 100 watt SSB ham transceiver?

We imagine that these questions will be fully addressed by the time receivers get on the market. DBS satellite TV had a number of problems when it first burst upon the scene and has managed to overcome them.

■ Final Four Wheel Frontier

Driving and listening to the radio are two things virtually every American enjoys. Radios started appearing in cars shortly after mass production made the automobile an object of middle class desire. AM was joined in

SAMPLE OF CD RADIO'S AUDIO LINE-UP

30 of CD Radio's 50 channels will feature audio formats in these self-explanatory niches.

1. Symphonic
2. Chamber Music
3. Opera
4. Today's Country
5. Traditional Country
6. Contemporary Jazz
7. Classic Jazz
8. Blues
9. Big Band/Swing
10. Top of the Charts
11. Classic Rock
12. 50's Oldies
13. 60's Oldies
14. Folk Rock
15. Latin Ballads
16. Latin Rhythms
17. Reggae
18. Hip-Hop & Rap
19. Dance
20. Songs of Love
21. Singers + Strings
22. Beautiful Instrumentals
23. Heavy Metal
24. Album Rock
25. Alternative Rock
26. New Age
27. Broadway's Best
28. Gospel
29. Children's Entertainment
30. World Beat

the late 60's by FM and in the 80's by cassettes, with just a brief fling with the 8 track cartridge tape in between.

Now, even before CD players become standard equipment, satellite delivered audio with 50 channels is fast approaching. Most of us never even had the chance to enjoy mobile shortwave radio. Maybe AMRC or CD radio will consider adding the BBC or at least devoting one channel to a replay of World Radio Network's line-up. That would be nice.

For more information on AMRC and CD Radio check out their websites at <http://www.skycell.com> (AMRC) and <http://www.cdradio.com> (CD Radio). Information on these sites is fairly sparse, especially AMRC, where you wouldn't know they're even involved in the DARS business. Keep checking these sites as time goes by; they may yet gradually evolve into something. Or, you may write them at American Mobile Satellite Corp. 10802 Parkridge Blvd., Reston, VA 20191-5416 and C.D. Radio, Inc., 1001 22nd Street NW, Washington, D.C. 20037.

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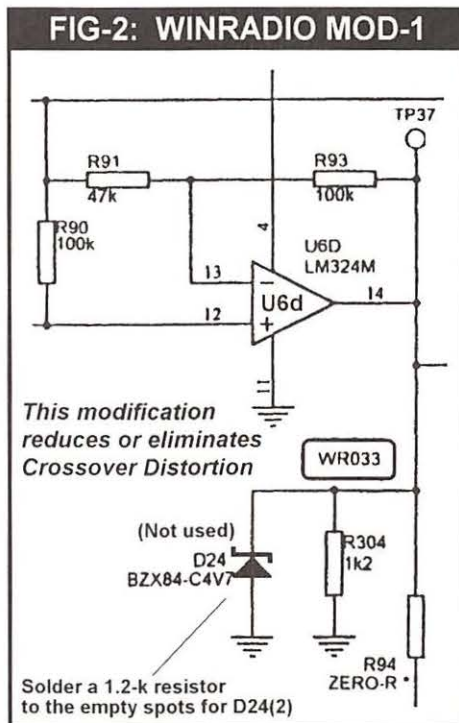
WiNRADiO SMT Device Primer

This is the first of a series of performance and feature upgrades for the WiNRADiO wide-spectrum communications receiver. Last month's column offered detailed instructions to safely and completely disassemble the WiNRADiO receiver. Please save that column for posterity! This month continues the series with a little warmer-upper enhancement that's within the capabilities of most hobbyists. It's easy and shouldn't take much time, but it will bolster your confidence to dig into WiNRADiO for the heavier stuff that comes later.

Reducing Crossover Distortion

This sweet and easy hack reduces "crossover distortion" in the output of U6d, the audio preamplifier for the power amp, U9. The procedure is a piece of cake: refer to Figures 1-2 and the following steps:

1. Disassemble WiNRADiO per instructions given last month (Sept 97).
2. On the normally unseen (back or bottom) side of the smaller WiNRADiO daughterboard, locate the unused spots for D24(2). Use Figure 1 as a guide.
3. Solder a 1.2-k SMT resistor (size 1206) to the empty spots for D24(2). (See Table 1) A tiny 1/8-watt or 1/10-watt leaded resistor will work if the leads are bent tightly around and clipped to mate with the pads for D24(2). That's all there is to this one, folks!



The Technical Stuff

See Figure 2 where we put a 1.2-k resistor in parallel with the existing 1.2-k R304. This drops the load impedance for U6d to about 600 ohms—probably a better impedance match for the programmable volume control,

U8, (not shown), that lies between U6d and U9. Conveniently, the pads of D24(2) are unused; and are a prime location for the new 1.2-k resistor.

By the way, even though it's fairly obvious, the value shown in the schematic as "1k2" is how the more familiar "1.2-k" is expressed in many other countries. Makes sense, if you think about it. You'll run into subtle differences like this, the more you explore WiNRADiO, so don't panic or freak out.

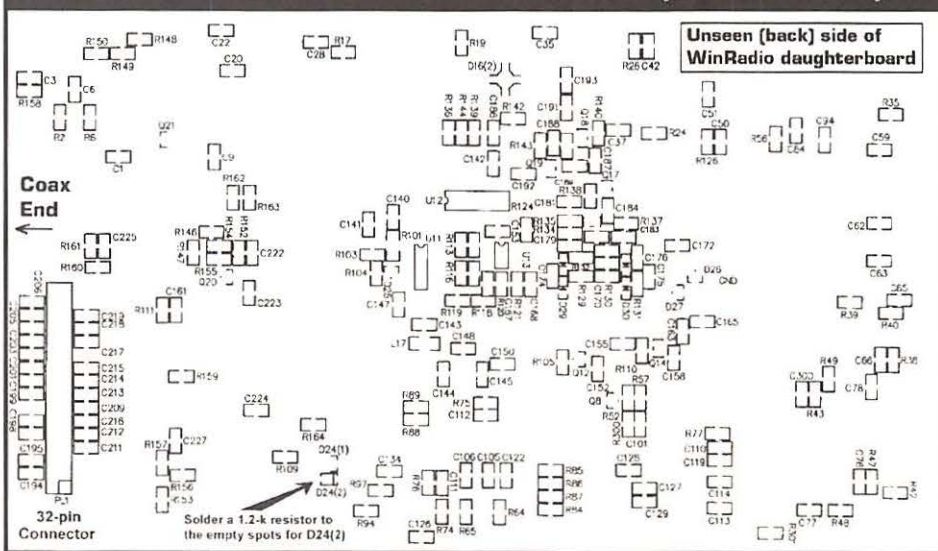
Parts Required For Other Mods

If you'd like to get prepared with all required parts for this and the next three WiNRADiO mods, Table 1 offers a list of what you'll need:

TABLE 1: WINRADIO MODS PARTS LIST

MOD	# ITEM	VALUE	TYPE/SPECS
1	Resistor	1.2-k ohm	SMT 1206 5%
2	Capacitor	0.1-uF	SMT 0805 X7R
2	Resistor	12-k ohm	SMT 0805 5%
2	PIN Diode	VHF/UHF switch	MMBV3700-LT1 or HSMP-3830 or 1SS314 or MMBV3401-LT1
2	Wire, ins	4"	22-24 ga solid
3	Capacitor	100-pF	SMT 0805 X7R
3	Capacitor	100-pF	SMT 0805 X7R
3	Capacitor	0.1-uF	SMT 0805 X7R
3	Capacitor	0.1-uF	SMT 0805 X7R
3	Resistor	18-k ohm	SMT 0805 5%
3	Resistor	18-k ohm	SMT 0805 5%
3	Resistor	12-k ohm	SMT 0805 5%
4	IF Filter	CFW4551	Ceramic IF filter

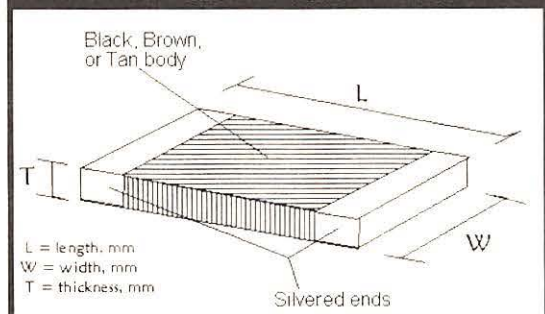
FIG-1: DAUGHTERBOARD (BOTTOM)



I am making up kits of the above parts for those who don't want to sweat the minimum orders required by some vendors, as well as those who aren't all that accomplished on the SMT parts scene yet, to ensure that all the exact parts are handy. All 12 parts and the 4-inch wire come in a packaged "kit" for six bucks, plus a buck for shipping and handling. Make it US\$7.00, ppd/domestic (US\$10.00 ppd, surface, for all foreign). Allow more for airmail. Order my part no. WRKit1-4.

You can, however, get most everything you need from DigiKey (800) 344-4539; Mouser (800) 346-6873; and/or Future-Active (800) 655-0006. The ceramic IF filter

FIG-3: SMT RESISTORS & CAPACITORS

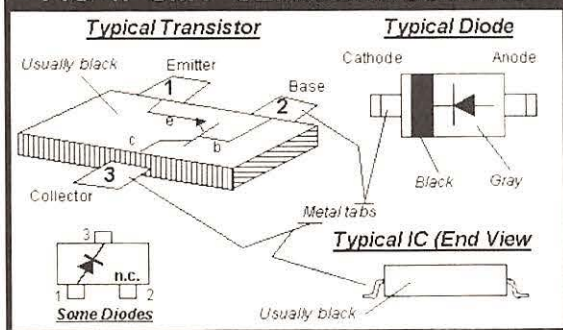


might be a problem, but I am working on finding independent sources of those for you, as well.

■ Basic SMT Device Primer

WiNRADiO consists of about 97.3% surface mount technology (SMT) components. Even though it is possible to use "normal" leaded components with most of our modifications, you can literally paint yourself into a corner with that kind of shortsighted shortcut. It's not possible to give you the big picture in this limited space, but heed my caution that "normal" components could be so large as to complicate or prevent other modifications. Please use SMT components whenever specified.

FIG-4: SMT SEMICONDUCTORS



Figures 3 and 4 graphically depict the appearance and shapes of many SMT devices. Table 2 identifies the common sizes and dimensions of SMT resistors and capacitors:

TABLE 2: SMT DEVICE TYPES/SIZES

Type/Size	Length	Width	Resistor Thick	Watts
0402	1.0 mm	0.50 mm	0.35 mm	1/16
0603	1.6 mm	0.80 mm	0.45 mm	1/16
0805	2.0 mm	1.25 mm	0.60 mm	1/10
1206	3.2 mm	1.60 mm	0.60 mm	1/8

Even though the dimensions of the above SMT types are given in millimeters (for accuracy), the Type/Size numbers actually relate to inches. For example, the 0805 type is about

.08"L x .05"W. The 1206 type is about .12"L x .06"W. The 0805 and 1206 are more common to the hobbyist, but 0603 and 0402 are often seen in manufacturing. 0402 types are just specks and are easily blown away by heavy panting or even blinking. (May your chosen deity help you if you sneeze in the same room as a pile of 0402 parts!) When you have a choice, stick to the larger types if you know what's good for you. There is no functional difference among the sizes other than wattage ratings for resistors and voltage ratings for capacitors.

■ More About SMT Devices

Working with SMT stuff by hand is usually an afterthought of R & D and/or Prototyping on the industrial scene. Self-respecting consumers aren't about to mess with the innards of modern electronic apparatus. So, it's not easy to learn hobby-grade SMT except by trial and error....and a rare article like this one. Here are a few tips and kinks that I've picked up along the way.

Tools For SMT Work: Use medical tweezers for handling SMT devices. Tweezers have a limited-force grip that won't damage the part like other tools can do. The angled tweezer tips permit maneuvering the part without your hand blocking the view. Angled tweezers afford a clean release that is less likely to dislodge the "speck" after you've painstakingly placed it.

Normal soldering tools for electronics are fine for hobbyist SMT work, but the critical thing is a slender, pointed tip on the soldering pencil. Don't use conventional copper tips, either! Instead, use the silver-colored "iron clad" tips. These tips transfer heat somewhat better than copper, and they don't corrode as readily. Heat range of the soldering pencil isn't critical, but 12-30 watts is fine; 50-watts, if you're good at this work.

Salvaging SMT Parts: Don't be pennywise and pound-foolish, salvaging SMT resistors and capacitors. SMT devices can be damaged by excess heat from repeated soldering actions, so even though you manage to salvage a part, you have no assurance that it is any good.

Once they're soldered, to remove them it's best to wick excess solder from the pads; crush the part with a pair of diagonal cutting

pliers, and then desolder the broken ends. Transistors, diodes and IC's can be salvaged with greater chances of success because of their tabbed leads.

Installing SMT Parts: To install an SMT device, it is wise to take time and pain to ensure that it is properly and accurately positioned on the pads before soldering it. Once it is in position, hold it down in place with the tip of the tweezers pressing on the body of the device. Apply straight-down pressure because angled force will invariably cause the part to slip six feet just as you apply heat and solder. Some guys like to apply a tiny dot of rubber cement to the bottom of an SMT device before putting it in place. I suppose this can minimize slippage, but it takes more time and can be messy if you're not careful. Don't solder an SMT device until you are certain that it has been properly positioned and won't move during the process.

Soldering SMT Parts: Apply a bit of solder to the freshly wiped, fine-pointed tip of your soldering pencil. Press down on the SMT part as described above, and touch the soldering tip to one pin, tab, or end conductor of the device.

Within a second or two, enough solder should flow from the tip to the pad and the device to at least hold it for the time being. Now, holding solder in one hand and the soldering iron in the other, apply a tiny dollop of solder to the other end of the device or to another pin or tab. Let enough solder flow to do this connection right the first time. Then, go back and touch up the first solder joint so that it is "right."

■ More Information

The latest information and software updates for WiNRADiO are available at their US Web site at <http://www.winradio.com> and at the Australia site: <http://www.winradio.net.au> If you don't have a WiNRADiO, you can still download the latest software and run it in demo mode. I freely provide tech support on the WiNRADiO mods and all my articles by e-mail or (heaven forbid) postal mail that includes an SASE. Fax inquiries are fine, but please include your e-mail or postal address if you need a reply.

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Just The Way Life Is

Well, here we are with the summer of '97 just a memory and the winter holidays fast approaching. I feel cold just thinking about it. We have a mixed bag of topics to cover together so let's get right into them.

■ More Radirafting

Following our look at the decoding program *Radioraft* in August, Barry Stone sent an e-mail detailing his observations using this program with his Racal RA17. (Hm-m-m, I think I know that company!) He compared Radioraft to his PK-2323 (think he meant a PK-232) and "... found that the mode recognition (of Radioraft) is quicker and more reliable than the PK, plus of course it decodes a lot more modes."

Barry has tried Radioraft with a whole host of interfaces, including a homemade interface from the Unofficial Hamcomm Internet site using a TL071 amp, Tigertronics BP2M, a BATG ST5 and a commercial Redifon data modem. He reports that they all worked about the same and suggests the homemade, very low cost interface.

I have done some more work with Radioraft and found it to be excellent for decoding signals in the clear. If my R71 can separate them, Radioraft can decode them. Clearly, this could be enhanced by an active filter stage, or automatic gain control stage in the hardware interface. As Barry points out, and I have also observed, the simple interface works great most of the time. Problems only occur when it "hears" more than one signal and at very low signal levels. But overall, considering its cost, Radioraft with the simple interface does a great decoding job. Thanks for your input, Barry.

■ **SWRL v2.0 is Here!**



Back in February we looked at a very nice SWL logging program called SW Radio Log (SWRL) from DXtreme Software. Version 1.0 had lots of excellent features and was a real bargain at around \$25. Bob Raymond, President of DXtreme, sent the new version, 2.0. It has added additional features to an already fine-tuned program.

Additions in version 2.0 fall into two categories: database searches and report writing. The program's Script Editor now allows you to create and edit files for QSL reporting. The user can create a number of reception forms, or templates, for different uses. This includes different language reports as well as different physical layouts and information content. They are very easy to create and use.

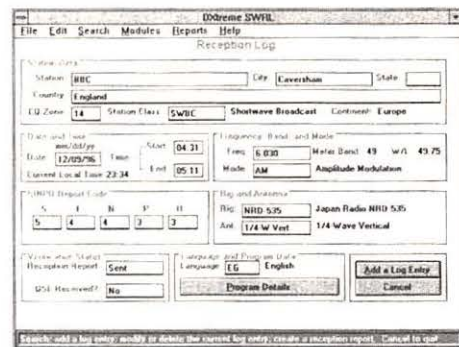
Version 2.0's station search engine now allows its user to call up previous receptions by station country, in addition to its name and reception date. The search also seems quicker.

Dictionaries of common French, Portuguese and Spanish words are included to help in QSLs requests. And SWRL v2.0 now supports Word 97 for all you people who bought Bill Gates' latest wordprocessor.

When you want to send out these professionally prepared reception reports, DXtreme makes it just as simple. For example, sending reception reports via e-mail to NASWA is now a simple mouse click operation.

If you bought a previous version of SWRL and live in North America, the total cost of the upgrade is only \$5, and that includes shipping! In my opinion, it's \$5 well spent. Elsewhere it costs \$7 USD. If you don't already own an older version, to upgrade to version 2.0 is \$26.95 in North America; \$28.95 anywhere else. Download the demo version of

SWRL v2.0 from their Web site at <http://www.qth.com/extreme>. Their snail mail address is 26 Langholm Drive, Nashua, New Hampshire 03062.



■ **We get letters ... Boy! Do we!**

It's been a number of years since I proposed the concept for Computers and Radio column to Rachel Baughn, the very fine chief editor of *Monitoring Times*. Since the very early days of the column I have received many, many letters from our readers. Some ask for assistance. Others relate your experiences with products. And still others have told me how much they enjoyed, or didn't enjoy, the column. Most of the letters — and more recently, e-mails — have fallen into these categories. That is, until now.

When I conceived of the column in 1990, I already had many years of industrial experience and had seen the critical role that computers played in military communications. But in 1990, computers were just starting to impact the professional and consumer communications world. I knew the effect on all of us would be dramatic. I had seen this technology-shift phenomena many times before in my industrial electronics career.

In the 1930's, 40's, 50's, and 60's, electronics was synonymous with vacuum tubes (valves as they are called in the United Kingdom). Every electronic circuit used them. No one could conceive of an electronics world without vacuum tubes. They were the main section of every electronics catalog. Local television repair shops stocked hundreds, even thousands of tubes. I know this firsthand since

[illegible]

my Dad was in the TV and stereo repair business, among many other businesses, and his home-repair trucks each carried over 200 tubes. By the 1970's the venerable tube was being pushed into extinction by the transistor.

Then one day in the late 1970's they disappeared! The vacuum tube, which reigned supreme for over forty years, was gone. No fade out. They, and an era, were gone, probably forever. It happens just that way in all facets of life, not just technology. Perhaps it's because we humans are so self-centered that we think that life will stay forever just the way it is today. I guess we didn't pay attention in our history classes and missed how many hundreds of generations before us saw their world change just as suddenly. What appeared as stable, non-changing ways of life were in reality just lulls in mankind's development.

Today, radio communications, along with all personal communications methods, are going through great changes. Gone are the days, filled with romance and excitement, of communicating on 20 meters with someone on the other side of the world; the thrill of riding the electronic waves on the ionosphere. Now we just pick up the phone and dial. No chance happenings, sun spot considerations, MUF or uncertainties here. Just 55 cents a minute.

Remember the uniqueness and special feeling that went along with using wireless radio communications? SWLers, hams, and CBers know exactly what I'm talking about. It was almost like belonging to an elite club, the "My Voice is Sent Over Radio Waves" club. Our friends and family were in awe.

Well, now our mothers have more on-air time and hold more DX QSOs than we ever did. How? Via their cellular phones. Yes, they are the common person's walkie-talkies of the 1990's. Ten years ago could you imagine a walkie-talkie that would allow you to communicate with people around the world? No? Well, think of what the now common cellular phone and the cell site infrastructure represents to the common person.

So, should we be surprised that the man-in-the-street has lost their awe of shortwave communications? Just as we are no longer in awe of fire, as were our pre-historic ancestors. Add the World Wide Web to everyone's life and they have instant access to almost anyone, anywhere! Mankind's technology is evolving, as it has since the beginning of time.

■ Get The Culprit!

Who is to blame for the radical changes we are seeing in communications today? Well, according to the latest letter I received, the instigator of all this is none other than yours

truly, MEeeee!

The letter goes on to say that by introducing the computer to radio users I "planted the seeds of radio's destruction ... and continue to do so with your discussion of the evil internet." The letter goes on for four handwritten pages relating how I have "encouraged," "fostered," and "led" the communications users to their final chapter. The letter ends with a solemn warning, "Go ahead. Keep pushing the internet and computers and radio will be finished."

I beg to remind this person, and all of us, that due to the rural nature of my community (which I like just that way) I didn't have Internet access until mid 1996. Also, I suggested in a previous column that the uncertainty and skills which made DXing shortwave an art and so enjoyable would never be duplicated by the Internet. Been There, Done It, Got The T-Shirt.

However, as I said above, in 1920 the technologists of the day could not conceive of a world without spark-gap transmissions. Less than fifteen years later they were gone. Perhaps the final curtain is now coming down on analog voice/picture modulated SSB, AM, and FM signals with the advent of digital communications.

Two quotes from well-known writers of the 20th century come to mind. The first, from Marshal McLuhan, a philosopher of the 1960's, observed that "The media IS the message." *How* we communicate is as important as *what* we communicate. I don't think he was pondering what we are faced with in communications today. However, I'm sure all of us SWL DXers would agree with him. And finally, the famous jet pilot turned writer, Richard Bach, reflects in his novel *Illusions*, "What the caterpillar calls the end of his world, the butterfly calls its beginning."



THE
MARSHALL McLUHAN CENTER
ON
GLOBAL COMMUNICATIONS

Yes, we have seen dramatic change in radio communications in the past year or two. These have left us all very disoriented and navigating in a totally new territory. I am as bewildered as anyone at the speed of change. And, at least initially, a bit disappointed at all the changes.

But, as I have seen with the passing of the vacuum tube, discrete transistors, AM on shortwave, the slide rule, manually tuned radios, and paper logs, the future is uncertain but not necessarily to be feared. Remembering and learning from the past, while embracing and attempting to understand the opportunities of the future, has brought us from the spark-gap to where we find ourselves today ... And to wherever we will be tomorrow. The journey continues.



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Standing on Protocol

Welcome to *Digital Digest*. In this column we'll focus on some of the basics of digital monitoring, the facilities that use these modes, and a brief description of the major digital protocols employed on the HF and VHF bands today.

To many of you, I'm sure, the word "digital" brings to mind Baudot radioteletype (RTTY), one of the oldest codes still in use today. Once the mainstay of the digital shortwave modes, RTTY now comprises only about 50 percent of the decodable signals out there in the airwaves.

By way of introduction, we'll examine which stations/facilities use these modes, as well as identify their major message types. A very brief introduction to currently used digital modes then follows. Formerly limited to the shortwave (HF) spectrum, the VHF/UHF bands now present new opportunities for the digital monitor.

Utility stations generally operate within one of three broad classifications:

- * Aeronautical
- * Maritime
- * Point-to-Point

and may be designated as either fixed or mobile with respect to location. Unlike the international shortwave broadcasters, utility station traffic is intended only for the parties involved, and is therefore confidential in nature (i.e., may not be repeated or used to another's benefit).

Utility stations use a variety of modulation types. These include the "3 R's":

- * Radiotelephony (Voice - ISB/SSB)
- * Radiotelegraphy (Morse Code/CW)
- * Radioteletype (RTTY/other Digital Modes)

Traffic currently being monitored by digital hobbyists includes the following:

Aeronautical

- Aeronautical Fixed Telecommunications Network (AFTN)
- Aeronautical Actual and Forecast Weather
- Terminal Area Forecasts (TAF)
- Aircraft Flight Plans and Arrival/Departure Messages
- Notices To Airmen (NOTAMS)
- ACARS (Air/Ground Aviation Messages and Aircraft Telemetry)

Maritime

- Inland Stations
- Great Lakes & Inland Waterways Weather and Traffic
- Coastal Stations

- Weather Synopsis, Reports, Watches and Warnings
- Iceberg Alerts (North Atlantic)
- HYDROLANT/HYDROPAC Broadcasts
- NAVTEXT and NAVAREA Broadcasts
- Telex Traffic to Individual Vessels
- News, Sports & Financial Reports

Vessels/Ships

- AMVER Position Reports
- Telex Traffic to Shore Stations
- Soviet Fishing Fleet

Point-to-Point

- Military
- World Air Forces, Navies and Armies
- Coded and "In-the-Clear" Message Traffic
- Military Flight Plans and Routings
- FAX Charts and Maps (Weather and Tactical)
- Naval High Seas Weather Broadcasts
- MARS (Military Affiliate Radio System) Traffic
- Coast Guard (American and Canadian)
- Coast Guard Communication Stations/CG Cutters
- FAX Weather Charts and Maps/Satellite Photos
- Iceberg Alerts (North Atlantic)
- Various Maritime Service Broadcasts

Press Agencies

- International News Agency Broadcasts
- Newspaper Press Photos (FAX)
- Non-Latin Alphabet Press (FAX)
- Chinese, Russian, Arabic, Japanese

Meteorological Stations (Worldwide)

- Forecast and Actual Weather Broadcasts
- Weather Charts and Maps
- Orbiting Weather Satellite Photos

Diplomatic/Government Embassies

- Inter-embassy Traffic/Ministry of Foreign Affairs

Law Enforcement

- INTERPOL Traffic
- Police Communications

Science and Research

- Antarctic Research Stations

- Astronomical Observatories

International Relief Agencies

- United Nations Agencies
- International Red Cross/Red Crescent Society

Point-to-Point Circuits

- International Banks and Financial Agencies
- International Business Corporations
- Pager Communications

HF Digital Modes (Shortwave Bands)

- ARQ-E Newer mode, mostly used by French military, stations may idle for hours.
- ARQ-E3 Newer mode, mostly used by French military, stations may idle for hours.
- ARQ-M2/4 Older mode, used by all three categories of utility stations.
- ARQ-N Newer mode, single channel ARQ, very few frequencies identified to-date.
- ARQ-S Newer mode, very few frequencies/stations found to-date.
- ARQ6-90/98 Newer modes, used by French and Italian Embassies.
- ASCI Little commercial usage — some experimental use (amateur radio).
- AUTOSPEC Limited to a small number of British maritime stations.
- CIS Synchronous teleprinter system using 11/14/27 bits (former Soviet Union).
- CLOVER II Sophisticated amateur radio protocol. Most reliable digital ham mode.
- COQUELET Similar to PICCOLO, used by Belgian and French military/police.
- CW Being phased out for maritime usage — still heavily used by hams.
- DUP-ARQ Newer mode, used only by Hungarian embassies.
- FAX Transmission of weather charts and maps, press and satellite photos by international press, military, maritime, and meteorological stations.
- FEC-A Newer mode, not many stations logged to date (German press,

	German, Serbian and Indian embassies).
FEC-S	Newer mode, not many stations/frequencies logged to date.
HC-ARQ	Newer mode, Haegelin-Cryptos teleprinter system, European loggings.
HNG-FEC	(Hungarian FEC) Newer mode, used exclusively by Hungarian Embassies.
PACKET	Repetitive inter-computer traffic. Used by hams and MARS stations.
PACTOR	Newer "adaptive" amateur radio protocol. More reliable than packet.
PICCOLO	Used by British military almost exclusively. Now generally encrypted.
POL-ARQ	(Polish ARQ) New mode, used exclusively by Polish embassies.
RAC-ARQ	Newer mode, 150 Baud teleprinter system. No reports of any loggings.
RS-ARQ	Newer mode, Rhode & Schwarz simplex ARQ teleprinter system.
RTTY	Oldest and most widely used mode by all utility categories.
RUM-FEC	(Romanian FEC) Newer mode, used exclusively by Romanian embassies.
SI-ARQ	Newer mode, used primarily by Austrian and Indonesian embassies.
SI-FEC	Newer mode, no traffic reported to date by monitors.
SITOR	(Simplex Teleprinting Over Radio - aka ARQTOR/FECTOR)
SITOR-A	Primary maritime mode used for inter ship/coastal station communications. Also widely used for diplomatic embassy traffic.
SITOR-B	Primary maritime coastal station broadcast mode for weather advisories and ship traffic lists.
SSTV	(Slow Scan TV) Used by hams to transmit still pictures.
SPREAD	Newer mode, used exclusively by Romanian embassies.
SWED-ARQ	(Swedish ARQ) Newer mode with usage limited to Swedish embassies.
TWINPLEX	Newer mode, used by INTERPOL and Danish/Norwegian MFA.
VFT	(Voice Frequency Telegraphy) British, Canadian and German military mostly, most difficult mode to tune due to multiplex (multi-channel) signal.

■ VHF/UHF Digital Modes

ACARS	(Aircraft Communications Addressing and Reporting System) Digital air/ground traffic including aircraft telemetry.
FAX	(Facsimile) Weather satellite photos from orbiting Russian/American weather satellites.
POCSAG	(Digital Pager Code) Used to transmit telephone numbers and short alphanumeric text messages to personal pager units.
GOLAY	(Golay Sequential Pager Signalling System) A more sophisticated system used to transmit text messages to personal pager units.
PACKET	Repetitive inter-computer traffic. Used by hams.
RTTY	Commercial news services on satellite transponders.

You'll notice that the list of HF modes contains many which are specific to the embassy traffic of one or more countries. Much of these transmissions are encrypted (coded). An analysis of digital HF signals from over 4,000 reported fixed station frequencies heard in North America during the past 12 months has revealed the following mode usage:

RTTY	53.7%
SITOR	20.4%
ARQ-M	11.1%
ARQ-E3	9.4%
ARQ-E	4.5%
FEC-A	0.7%
All Others	0.2%

■ Monitoring Equipment

To monitor digital transmissions you require a decoder. Decoders are available as independent outboard units or as an integral part of your personal computer system. In either case, they take the audio signal from your receiver and convert it to intelligible form that is displayed on a video monitor or the decoder's own "marquis-like" display. Many of today's decoders are also capable of translating Morse code (CW). A stable shortwave communications receiver is required for serious non-voice utility monitoring.

Only very recently have decoders become available for ACARS and pager modes in the VHF/UHF bands.

Most old-timers in the hobby originally started by listening to the international shortwave broadcasters. With the introduction of SSB modes, the true utility listener was born. Increasing use of Baudot RTTY on the airwaves saw the introduction of out-board decoders. Only the strongest and cleanest signals could be decoded by the early units — more

sophisticated monitoring required more expensive equipment, often in the form of surplus commercial hardware. Then in the 70's, Infotech introduced their high end decoders.

With the advent of satellite technology, RTTY monitors lost the myriad of frequencies once used by the major press agencies such as the Voice of America, Associated Press, and United Press International. With the demise of the Soviet Union, over 50 former TASS frequencies are now silent.

Despite the services that have now opted for newer communications modes, there is still plenty to monitor for today's digital utility enthusiast.

Some shortwave utility stations have fixed broadcast schedules, others transmit only when they have traffic.

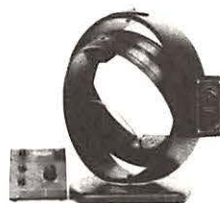
Most stations have several frequencies from which to choose. The general rule-of-thumb is that they will use the highest frequency that supports current propagation conditions during their local day, gradually moving to lower ones as local night falls.

Although most stations use very low transmitting power with respect to the international shortwave broadcasters, you will often be amazed at the strength of their signal. Digital transmissions, because of their signal nature often have a way of "getting through," especially during poor propagation conditions when the broadcast bands seem dead.

Many of the digital transmissions you will encounter are indecipherable. Military and embassy traffic of a sensitive nature is generally always encrypted (encoded).

When first starting out in this phase of the hobby, it is just as important to know "what not to listen to." All too often new monitors are easily discouraged because they are trying to decode the wrong signals. With patience and experience you will develop an "ear" for the various modes, and in many cases be able to identify the mode by its sound. Many experienced monitors can even audibly determine the baud rate.

Award Winning Antenna



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Optoelectronics Micro DTMF Decoder

By Haskell Moore

They say that the only difference between men and boys is the price of their toys. And Optoelectronics is doing all it can to see that we big boys have all the electronic toys we could ever want!

Optoelectronics has recently launched a product line called Techtoyz®, a series of electronic devices fitted into beeper-style cases. Currently, there are three products slated for this line, with the Micro DTMF Decoder currently shipping. Also available is the Micro Counter frequency counter, with a range of 10 MHz to 1.2 GHz. By the time this issue hits the newsstand, the Micro RF Detector (an RF field strength meter) should be in production. And yes, all three are top-quality, sophisticated electronic devices that fit inside a standard beeper case!

At first I couldn't believe it when I opened the package. The only discernible difference between the Micro Decoder and a regular beeper was the weight. The Micro Decoder was so light I thought it was an empty case. However, a flip of the switch proved it was a working model with the "AA" battery already installed.

The Micro DTMF Decoder may be small on size, but it's big on performance. It can decode all 16 DTMF digits and store up to 2,000 characters in non-volatile memory. The unit is capable of continuous operation for over 200 hours on a single battery. When a string of digits is received, and after a three second break, a space is inserted for readability.

The twelve character LCD display is the same as those used in a conventional beeper. By depressing one of two buttons, the display can be scrolled one digit at a time in either direction. Holding either directional button down results in a fast (but readable) continuous scroll. With a combination of two buttons, the display jumps to either the beginning or end of the



character string.

Another great feature of the Micro DTMF Decoder is its highly sensitive built-in microphone. This allows the decoder to pick up audible DTMF tones without any direct connection to the tone source. For example, DTMF tones emitted from speaker phones, modems, two-way radios, and scanners can all be easily decoded and stored discreetly. Depending on volume and clarity, the decoder is capable of capturing tones up to fifteen feet away. Given its performance, Optoelectronics must have gone to great lengths in designing the audio section of this device.

The decoder also has a miniature phone jack on the side of the unit for an external microphone or direct hookup to line-level input. This allows for a more stable and reliable connection to the signal source. To prevent interference, when the input jack is utilized, the internal microphone is automatically disconnected.

■ Practical Application of the Micro DTMF Decoder

Like any kid with a new toy, I couldn't wait to put the decoder through its paces. The first test was performed with my speakerphone. I put the decoder down a few inches from the speaker and dialed a number. At each key press, the digit instantly came up on the display. The next test was done with my computer modem. As the modem rapidly fired off the numbers, the decoder captured every digit.

However, when using the internal microphone, placement and distance from the speaker is relatively important. Too loud or too soft, and some digits may be dropped. The microphone is also somewhat directional due to its placement within the case. But with a bit of adjustment and a little experimentation, the decoder captured every digit flawlessly. Even when dialing at high speed, the decoder can capture at a rate of up to 12.5 digits per second.

Where the Micro DTMF Decoder is most reliable is in the direct connect mode of operation. By running a patch cord from the line jack of my PRO-2006, I was able to readily decode any DTMF tones received. The reliability of the direct connect was rock solid with no lost or incorrect digits during this tests.

If you're in the market for a DTMF decoder, you might want to check out this little unit, which sells for \$89. It has the features, functionality, and reliability of decoders costing twice as much. With Techtoyz, big things really do come in small packages!

The Micro DTMF Decoder is available from Optoelectronics, 5821 NE 14th Avenue, Ft. Lauderdale, FL 33334. They can be reached at 800-327-5912 or 954-771-2050.

His Master's Scanner

It's hard to believe, but another well-known firm has entered the ranks of scanning. RCA — yes, the same RCA that had Nipper listening to his master's voice — has introduced a line of three units.

The RP-6100 is a 20 channel handheld with 30 to 512 MHz coverage. It includes 20 channel memory, manual channel select, channel lock out, and NiCd recharge circuitry.

The RP-6150 is a 200 channel handheld scanner with 30 to 960 MHz coverage, 200 channel memory, two-second scan delay, memory backup, keypad lock, monitor memory, manual channel select, channel lock out, and NiCd recharge circuitry.

The RP-6200 is the base version of the '6100 and, like the '6100, it covers 30 to 512 MHz, has 20 channel memory, memory backup, keypad lock, monitor memory, manual channel select, and channel lock out.

All three scanners, with some minor differences, are apparently available as Radio Shack models. Still, the name RCA is powerful medicine and it will be interesting to see what the entry of this industry giant means to the scanning community. RCA scanners are available at Advanced Specialties Electronics, 114 Essex Street, Lodi, NJ 07644. Their phone number is 201-VHF-2067.

AM Sounds

It looks like an ear ache waiting to happen, but its manufacturer says that it's an AM radio so small that it fits in the side of your head. Called AM Sounds, it's just 1-1/8 inches long and weighs but a quarter ounce. Utilizing "sensitive TRF receiving circuitry and AGC control, AM Sounds is a self-contained unit — no cords, headphone wires, or clips to hang on your belt. Despite its small size, dial tuning lets you select the



exact station you want."

Tuning range is from 550 to 1600 kHz, missing the new expanded portion of the band. The radio runs 300 hours on one battery. The manufacturer (American Technology Corp.) says AM sounds produces "a rich, full, high-quality sound in one ear while the listener stays in touch with the surroundings with the other." They suggest many uses: jogging, hiking and — no kidding — *while talking on the phone*. Great idea.

To find out more about AM Sounds call 1-800-41-RADIO, visit their web site <http://www.atcsd.com>, or email atc-info@atcsd.com.

Total Flexibility

The universal whip antenna, sold by Grove Enterprises as a replacement for inefficient stock antennas, has become even more useful with the addition of a spring-supported base for less breakability and greater flexibility. The universal whip extends from 7 inches to 47-1/2 inches, receives 25 - 1300 MHz, and is equipped with a BNC base.

The antenna is also available in a 4 - 21 inch length for omission of low band; with right angle connector for use with a desktop receiver; or with N adaptors. Prices vary from \$16.95 for



the standard whip to \$23.95 for the right-angle N adaptor. Grove Enterprises can be reached at 800-438-8155 or e-mail order@grove.net.

Fired-Up Firestik

Firestik has upgraded the performance of its A99 CB base antenna with a new replacement whip. The Fire-Up 99 is a 5-foot, top-loaded whip that replaces the A99's upper 6 foot continuous loaded whip. Upgrading the A99 is easy, says the manufacturer, a simple two-step procedure: simply unscrew the upper A99 whip and screw in the Fire-Up 99.

Firestik's 5/8 wave, top-loaded coil design creates a lower angle of radiation that translates into more distance on the ground. The antenna also features Firestik's patented bare-hands tunable tip for additional range.

The Fire-Up 99 has a suggested retail price of \$20.99. The Firestik Antenna Company can be reached at 602-273-7151 or by e-mail at fs99@firestik.com



CB Gentrification

When a ghetto gets so bad that no one wants to live there, prices drop to nearly nothing, and, sometimes, a process of *gentrification* begins—people migrate back from the suburbs to fix up the homes and re-establish neighborhoods.

Something like this is happening to CB. If you think of CB as a bombed-out radio ghetto inhabited only by psychotics and squatters, then you'll be happy to hear what's happening. Around the country, pockets of serious, professional, and courteous operators are once again springing up. Granted, you still have to step across someone sleeping on a steam vent, cursing and mumbling something about "good bud-

dies," but for the most part, things are taking an upturn.

If you're one of the growing numbers who is thinking — privately, of course — about testing the waters in CB, here's your chance. CBs have come down in price to match the near give-away status of 49 MHz cordless phones.

An example: VALCO, a Louisiana-based firm, is selling the Uniden PRO-501XL for all of \$28.37. If you can rustle up two friends who also want one, the price drops to \$27.80 each. The PRO-501XL is a compact, 40 channel CB with LED display, automatic noise limiter, phase lock loop circuitry, volume and squelch control, up/down channel selector, push-to-talk mike and full mounting hardware. For \$28.37, you can afford to buy several and throw all but one away!

To order, call VALCO at 800-673-2244. Their mailing address is 2450 West Laurel Ave., Eunice, LA 70535. Please mention *MT* when you call.

ERGO for the AR7030

Creative Express has announced computer control software for the AOR AR7030. Called ERGO, the program was developed by John Fallows of Calgary, Alberta.

"ERGO provides a comprehensive and integrated environment to control the AR7030," says John.

Here's a basic rundown of the program's capabilities: a friendly "virtual front panel" for the receiver with control over on/off, volume, frequency, tone, pass-band, squelch, gain, mode, and



more. Band scanning features including seeking the next station, profiling the entire band, and dual scan.

Four hundred quick memories can be scanned and synchronized with the receiver's memories—a user-defined 500 record database that can be used to tune or receive. The database can be filtered by frequency, station name, country, transmitter site, schedule times, group, or language. Propagation evaluation is given to any transmitter site in the database and signal strength is displayed in a bar meter or time-series scope.

A minimum configuration is Windows 3.x running on a 486/66 with 8 Mb RAM and 800 by 600 video. The recommended configuration is Windows 95 running on a Pentium with 16 Mb RAM and 1024 by 768 video.

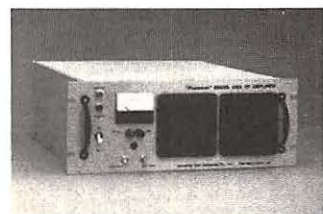
You can get a copy of ERGO for the AR7030 by sending a certified check or money order in the amount of US\$139 to Creative Express Corporation, P.O. Box 373, 16 Midlake

Blvd, SE, Calgary, Alberta, Canada T2X 2X7. You can get more info on ERGO by checking out their web page at <http://calgary.shaw.wave.ca/~jfallows/ERGO1.htm>

The e-mail address is johnfallows@mail.calshaw.wave.ca Mention MT when you write.

More Power

Looking for a nice 500 watt power amp? Industrial Test Company has introduced their new Powertron 500A, a punchy little unit that puts out 500 watts over a frequency range of 10 Hz to 1 MHz.



The 500A employs a closed-loop negative feedback circuit which ensures a low-output impedance (close to zero ohms). Full power is obtained with a load resistance of 1.25 ohms and 25 volts rms output voltage. However, any other combination of voltages (up to 15,000) and current (up to 200 amps) can be obtained through the use of an optional transformer. The 500A is fully protected against overloads and overheating.

ITC is located at 21 Yennick Ave., Port Washington, NY 11050. Their phone number is 516-883-1700.

Radio London Lives

Thirty years ago, Radio London took to the airwaves off the coast of England. Clearly the most successful of the offshore pirates, the station had its start in Texas in 1964 and a short life



that ended at 3:00 pm, on August 14, 1967, the "Summer of Love."

In its heyday, Radio London had an audience estimated to be in the vicinity of 16 million; it made stars out of its DJs and launched the careers of countless pop stars. It was, by some estimates, the largest commercial radio station audience in the world.

This past summer, East An-

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(plus \$2.50 S & H)

HOKA CODE-3 USA Version

"The Standard Against Which All Future Decoders Will Be Compared"

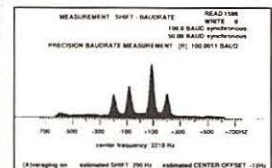
Many radio amateurs and SWLs are puzzled! Just what are all those strange signals you can hear but not identify on the Short Wave Bands? A few of them such as CW, RTTY, Packet and Amtor you'll know - but what about the many other signals?

There are some well known CW/RTTY Decoders but then there is CODE-3. It's up to you to make the choice, but it will be easy once you see CODE-3. CODE-3 has an exclusive auto-classification module that tells YOU what you're listening to AND automatically sets you up to start decoding. No other decoder can do this on ALL the modes listed below - and most more expensive decoders have no means of identifying ANY received signals! Why spend more money for other decoders with FEWER features? CODE-3 works on any IBM-compatible computer with MS-DOS with at least 640Kb of RAM, and a CGA monitor. CODE-3 includes software, a complete audio to digital FSK converter with built-in 115V ac power supply, and a RS-232 cable, ready to use.

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Business Notes

• One of our readers passes along this warning to anyone purchasing an AOR AR-8000 from outside the U.S. In addition to the risk you are taking that it could be

seized by Customs, there is also the likelihood that the radio will not be set up with the U.S. bandplan, and the distributor may not accept that as sufficient reason to allow it to be returned for refund. Be sure to ask before you purchase.

• Readers will be interested in two significant price drops, avail-

able from Grove. The Radio Shack PRO-26 wide coverage handheld scanner is being offered for \$200 less than the original selling price: now \$249.95. The ICOM R8500 tabletop scanner goes for \$150 less than its usual Grove price until October 31st, 1997. Call Grove at 800-438-8155 for more information.

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Lowe SRX100/Target HF-3

The tabletop model Lowe SRX100, sold in North America for \$279.95, is something of a surprise. The bargain hunter in us whispers, "Lowe and behold, it looks a lot like the Lowe HF-150. Maybe it's nearly as good, but much cheaper." Unfortunately, this isn't quite the case.

■ "Bucket brigade" distribution successful

For starters, the Lowe SRX100, despite appearances, is a Lowe in name only. It is actually the creation of a completely different British firm which markets it in the U.K. and Europe as the Target HF-3. (There is no indication as to the country of origin on our unit.) In North America, it is sold as the Lowe SRX100 through yet another intermediary, Virginia's EDCO (703/938-8105).

It is remarkable that a product with this many steps of distribution—from the U.K. originator to the U.K. exporter to the North American distributor to North American retailers...and only then to the consumer—comes through at such a reasonable price across the Pond.

■ Simple little receiver

Housed in a plastic case with a top-mounted speaker, the SRX100/HF3 is only slightly larger than a brick. On the front panel, there are just three knobs (on/off-volume, tuning, and clarifier), four buttons (two for modes, one for memory storage, and another for memory recall), and an easy-to-read digital display. That display shows mode, frequency, and signal strength via digital bars. But because the display is not illuminated, when it's dark you'll need a flashlight.

On the rear panel is an attenuator, the antenna socket, a connector for the external "wall wart" AC adaptor, and a jack for a headphone or external speaker. If you're looking for *simple* in a tabletop receiver, aside from the Drake SW1 this is "it."

The radio covers from 30 kHz to 30 MHz in the AM, upper-sideband and lower-sideband modes, but there is no synchronous selectable sideband. Of the two bandwidths, nominally 3.8 kHz for single-sideband and 6 kHz for AM, neither can be selected independent of mode. Tuning options are limited, as there is only one (!) solitary memory preset, and you'll find neither a keypad nor provision for connecting one.



■ "Hydramatic" tuning knob

The tuning knob uses variable-rate incremental tuning (VRIT) with four speeds—10/100 kHz and 1/10 MHz—which are automatically shuffled in and out depending upon how fast you turn the knob. Imagine, if you can, going from the nethermost longwave spectrum to the upper reaches of the shortwave spectrum in but three turns of the tuning knob. Spin it one calorie too vigorously, and suddenly you find yourself in a new dimension of time and space—or at least several megahertz up or down the world band spectrum from where you were.

Additionally, there is no device, such as flip-down feet or an elevation rod, to prop the receiver at an angle that is comfortable for operation. As a result, when spinning the tuning knob, you can keep rapping your knuckles on the tabletop. You can resolve this by using a homebrew prop or by picking up the receiver with one hand—it's very light—and spinning the knob carefully with the other.

Over time you get accustomed to playing "spin the dial and see where it lands." Of course, "you get accustomed to it" is the refrain used to excuse every manner of ergonomic shortcoming from a poor-contrast display to a jail cell, but this one is particularly puzzling. After all, what is the point of a 10 MHz-per-revolution tuning rate on a receiver that covers less than 30 MHz?

A lesser annoyance is that when the receiver is turned on, it automatically brings up the frequency and mode that are stored in the memory preset, not the last-tuned station. Too, if you want to change that mode, you must use the up or down button.

But there's a rub. If the receiver is in the upper-sideband mode, you cannot poke the up button again to access the lower-sideband or AM modes. No, you must use the down button to get there. And, if the receiver is in the lower-sideband mode, the only way to you can get to the AM or upper-sideband modes is with the up button. Of course, if the receiver is in the AM mode, you press "up" to access upper sideband

and "down" to access lower sideband.

Since there are only three modes, it would have made more ergonomic sense to have had a carousel-style access of all modes through either the up or down button, rather than a mix of both.

■ Whale of a warbling wail

Tuning the receiver in the AM mode to a world band station is straightforward. However, tuning in a single-sideband signal, such as a ham or utility station, is less so. To begin with, tuning is a two-control exercise. First, the tuning knob is used to tune as close as possible to the desired signal. Next, the clarifier knob, which has a frequency adjustment of plus or minus 800 Hertz, is tweaked to make the signal readable.

Among world band listeners, there is a time-honored technique—sometimes called exalted-carrier selectable sideband, or "ECSS"—that is used to banish or lessen adjacent-channel interference. That is, where you manually tune a world band station—which, of course, is in the double-sideband AM mode—in either the upper- or lower-sideband mode. Unfortunately, this technique, which calls for the fingers of a neurosurgeon and the ears of a bat, does not come off well with the SRX100/HF3. Too, the receiver does not automatically compensate for the BFO offset that results when you switch from the AM mode to either upper or lower sideband.

Suppose, for example, you are listening to a station on 5070 kHz in the AM (double-sideband) mode, and you think that tuning to one sideband or the other might result in less adjacent-channel interference. Press the button to USB, and you have to tune to 5072 kHz to prevent the receiver from howling like a scalded cat. If you change to LSB to see if it sounds better than USB, you must then retune to 5068 kHz—a jump of 4 kHz—to prevent a similar banshee wail.

But the problem doesn't end here, as it is impossible to use the clarifier control to produce normal audio. An unsteadiness, seemingly in the synthesizer, prevents the sort of relatively clean zero beat you get on many other receivers. Even with practiced hands and a safecracker's touch, we couldn't make the SRX100/HF3 properly "listen" to an AM station in ECSS, and regular single-sideband reception fared little better.

A niggling complaint is that the volume/on-

off control, at least on our unit, is decidedly non-linear—that is, move the knob just a little bit, and you go from soft to much louder in an instant. In addition, the microprocessor resets itself and goes to whatever frequency is stored in the memory preset if you turn down the volume to where you encounter resistance from the click-stop.

■ Performance superior for price point

The ultimate rejection of the two bandwidths is of supersub caliber—nothing short of superb! Yet, although the 6 kHz bandwidth actually measures a commendable 5.6 kHz, the shape factor is only a mediocre 1:3, for a barn-broad 17 kHz wide at -60 dB.

The 3.8 kHz SSB bandwidth measures 4.8 kHz in our lab, so the two bandwidths are in fact quite similar, even though the shape factor of the single-sideband bandwidth is good. Had this bandwidth met factory specs, which is really too wide for most SSB applications anyway, it would have been a good second bandwidth for AM-mode listening. Unfortunately, it doesn't matter, as on this receiver bandwidth cannot be selected independent of mode.

Image rejection is excellent, which is especially important for 60 meter tropical band reception. However, first IF rejection is poor, which means that under certain unusual circumstances the receiver will be susceptible to interference from nearby powerful stations.

Dynamic range is fairly good, but what really counts for strong-signal handling is that the third-order intercept point is excellent-to-superb. This is quite an achievement at any price point, but at \$280 is exceptional. On the other hand, sensitivity is only fair.

When listening to a broadcast that is free from interference, this receiver sounds pretty good, and our lab measurements help explain why. Although overall audio distortion at lower audio frequencies is 10-15%—a poor showing—it improves markedly to excellent-to-superb at higher audio frequencies. That low-frequency distortion may make for some listening fatigue over time, but as a practical matter audio quality is right up there with the best in this receiver's price class.

■ A bargain, but...

The Lowe SRX100 and Target HF3 are low-cost bargains in tabletop models. After all, \$280 is extremely attractive for this level of performance. With higher-quality bandwidths selectable independent of mode, improved weak-signal sensitivity and a less "twitchy" VRIT, these little radios would be hard to beat anywhere near their price points.

Nevertheless, these two receivers have substantially better signal-handling capability than such top-rated portables as the \$350 Sony

ICF-2010—and even many pricey tabletop models. If you are to connect your receiver to a high-gain outboard antenna, this is a major virtue you would not expect to find except in sets costing several times more.

This equipment review is performed independently by Lawrence Magne and his colleagues in accordance with the policies and procedures of International Broadcasting Services, Ltd. It is completely independent of the policies and procedures of Grove Enterprises, Inc., its advertisers and affiliated organizations.

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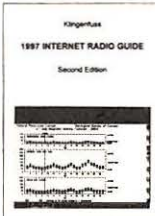
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Radio Shack PRO-67 Portable Scanner

Radio Shack is expanding the use of triple conversion circuitry in its scanner product line with the new PRO-67 portable. Like its double conversion PRO-51 predecessor, the 200 channel PRO-67 is manufactured for Radio Shack by Uniden.

AM and NFM modes are factory set and not selectable. Frequency coverage includes the VHF-low, VHF-high, commercial air, UHF, and 800 MHz bands. The designers censored frequencies adjacent to the cellular phone bands, so our PRO-67 will not receive 868.9625 or 823.9625 MHz. These two frequencies are licensed to several local and state governments, including the Illinois State Police trunked system around Chicago.

Memory Organization and Scanning

The PRO-67's 200 memory channels are divided into 10 banks. Memory backup is specified to be three days during power loss. The Philippine-made PRO-67 lacks some of the features found in upscale models. For instance, the PRO-67 does not alert you when programming a duplicate frequency in memory.

A 2-second rescan delay may be selected for individual channels.

We measured the scan rate at a blazing 68 channels/sec — fastest of all the models we've



Radio Shack PRO-67

tested. Empty channels, those programmed with 0.0, are automatically ignored during memory scan.

Users may designate one priority channel in each of the 10 memory banks. The PRO-67 checks each of the priority channels every 2 seconds while scanning or in manual mode, but not during searches.

Frequencies can be saved in any of 10 Monitor channels and later transferred individually to conventional memory.

Searching for Activity

The PRO-67 provides three ways to search for signals: Direct, Bank, and Service searching. Direct search, using the up and down arrow keys, searches from the display frequency in the direction of your choosing.

One pair of user programmable limits is provided for bank searches.

Service search hunts for activity among preprogrammed air, marine, fire, and weather frequencies. There is no police service search — an omission we consider peculiar, given that police monitoring is arguably the most popular use for a scanner radio. Police service search was missing from the earlier PRO-51 model, too.

You can lock out up to 20 frequencies during searches and review each one later, unlocking frequencies if you like.

Powered by AA Cells

The PRO-67 battery compartment is located at the lower rear quadrant and holds four AA cells. A small slide switch located above the batteries selects alkaline or NiCd. If the switch is set to NiCd, an optional wall barnacle power supply (RS #273-1665) can be used to power the scanner from 117 VAC and recharge the batteries simultaneously. An optional DC adapter (RS #270-1560) can do the same thing using an automobile 12 VDC electrical system instead.

The PRO-67's current requirements are frugal and ours draws only 65 mA while scanning. A battery save circuit reduces cur-

rent drain in Manual or Program modes after 5 seconds of silence and no keyboard activity. An icon on the display shows whether the battery save mode is active, and you can disable the battery saver completely by pressing the Priority key during power up.

Fine Display

The PRO-67 LCD display is much easier to read than the PRO-64 we tested last August. It maintains sharp contrast when viewed from several angles and the frequency digits are larger. Pressing the Light key illuminates the display boldly for 15 seconds using amber colored LEDs.

Keystrokes are confirmed by a beep tone, though the tone can be disabled by pressing the L-OUT key during power up.

Performance

Our PRO-67's small speaker produces audio of average quality, which distorts as the

MEASUREMENTS

RADIO SHACK PRO-67 PORTABLE SCANNER

S/N 75010355

Frequency coverage (MHz):

29 - 54 (5 kHz steps)
108 - 136.975 (AM, 12.5 kHz steps)
137 - 174 (5 kHz steps)
406 - 512 (12.5 kHz steps)
806 - 823.9375, 851 - 868.9375,
896.1125 - 1000 (12.5 kHz steps)

Sensitivity: see graphs

FM modulation acceptance: 13.5 kHz

Image rejection due to first IF:

59.5 dB @ 155.5 MHz

Practical memory scan speed: 68 ch/sec.

Search speed, Hyper: 243 steps/sec.

Search speed, regular: 94 steps/sec.

Current consumption at 6 VDC:

off - less than 20 uA

scan - 65 mA

full volume - 142 mA

Battery saver: after 5 seconds in

Manual mode.

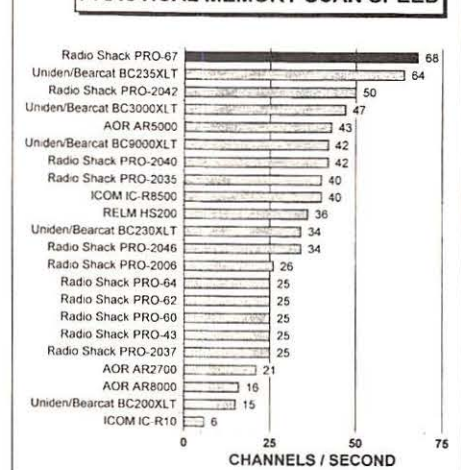
Low battery warning at 4.46 VDC or less.

Shutdown at 4.33 VDC or less.

Intermediate Frequencies:

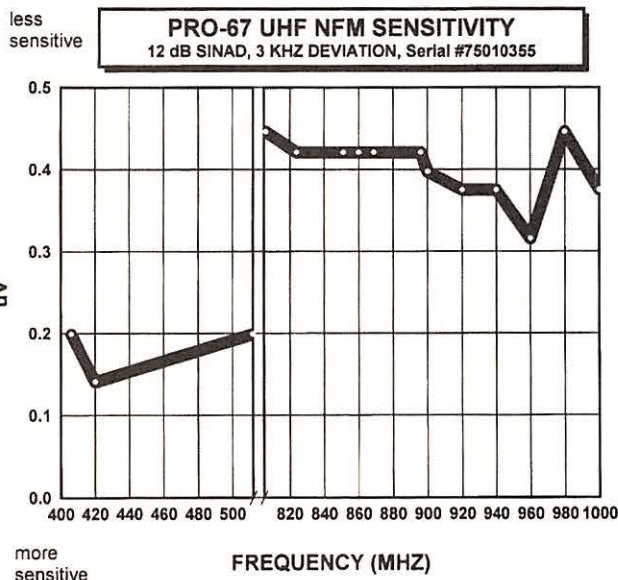
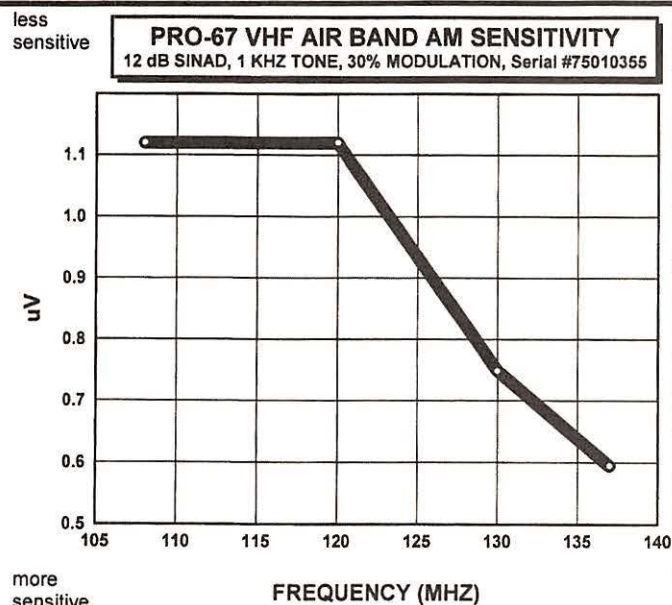
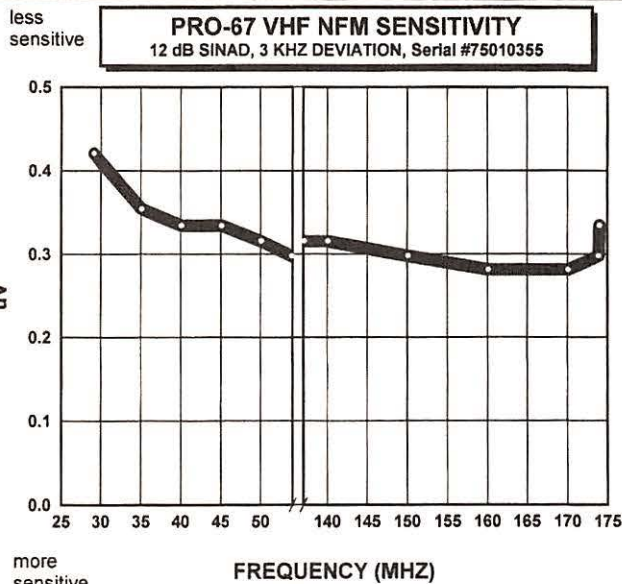
254.4, 10.85, and 0.45 MHz

PRACTICAL MEMORY SCAN SPEED

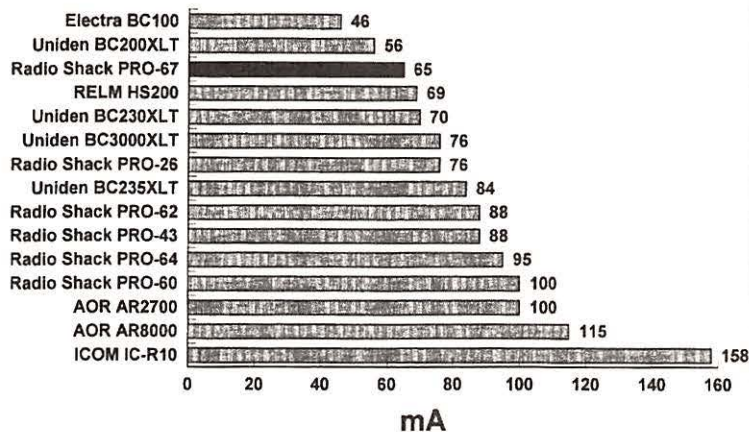


Notes:
1. Measurements made on one sample of each model.
2. Measured with memories programmed with unsorted frequencies in various bands and AM and NFM detection modes.
3. Measurements are approximate.

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Portable Scanner Current Consumption Measured While Scanning



Note: One sample of each model tested.

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volume control is advanced. Squelch action is acceptable, with the proper amount of hysteresis. The PRO-51's squelch tail is too long, producing a long noise burst at the end of each transmission. The PRO-67 squelch tail is shorter, though still noticeable.

We took the PRO-67 on vacation and put it to work monitoring local police, business, and motel frequencies. Practical use, along with test bench measurements, shows our scanner has little intermod and adequate sensitivity (see graphs). The PRO-67 and BC-235XLT share the same IF scheme, and the 254.4 MHz first IF accounts for very good image rejection — almost 60 dB at 155.5 MHz. That said, we do receive an image of TV channel 26 audio (547.75 MHz) near 39.05 MHz when using an outdoor antenna.

Our PRO-67 is clean in the 160 MHz railroad and 800 MHz land mobile range,

though we experience some adjacent channel interference from stations on UHF 12.5 kHz away when using an outdoor antenna. We measured the PRO-67's cellular rejection to be 49.5 dB in the VHF-low band. The signal-to-display frequency relationship on the VHF-low band is:

$$\text{actual transmitter frequency (in MHz)} = 763.2 + [2 \times \text{display frequency}]$$

For example, we can hear an 870.0 MHz signal when the PRO-67 is programmed to 53.4 MHz, though the 12 dB SINAD sensitivity is only 89 uV — on par with a turnip.

In Closing

Our PRO-67 is a good performer, with fast scanning and image rejection superior to the double conversion PRO-51. The PRO-

67's wide angle display, simple battery requirements, and low current drain are assets we long for in other models. Drawbacks include missing trunked frequencies adjacent to the cellular phone segments and omission of preprogrammed police frequencies. We consider the list price of \$300 steep, so watch for sales.

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Hex Conversion Made Easy

This month's tip comes from *MT* staffer Doug Smith.

"I noted in your August *Tracking the Trunks* a few recommendations for converting Motorola hexadecimal ID codes to Trunktracker decimal codes. It's easy math to those of us who have done some computer programming over the years, but maybe a bit obscure to those who haven't.

"Luckily, anyone with a Windows 3.10/95 PC can do this math with computer assistance.

"Open the Accessories window and locate Calculator. Run it. Pull down the View menu and select Scientific.

"If you want to convert a decimal number to hex, click the Dec button at the upper left of the window. Type the number (it appears in the box at the upper right). Now click on the Hex button; the number in the box is converted to hex.

"To convert a hex number to decimal, reverse the process. Click the Hex button, type the number you want to convert, and click on Dec.

"Of course, calculator is also handy for doing the necessary multiplication/division by 16. Be sure to do this step while the number is in decimal, in the order Greg Knox explained in your August column. This is because 16 hex is really 22."

Thanks a bunch, Doug, for the tip. I use that calculator every time I work on this column in checking fleet group IDs.

■ Any Questions?

Q. When I try to monitor trunked radio from 855-860 MHz on my Radio Shack PRO-39 Hyperscan scanner, I hear mostly images of cell radio phone conversations from 21.4 MHz higher. These cell phone conversations are stronger than the trunked system that I am trying to monitor.

How is the image rejection in this band for the Bearcat BC-235 XLT radio? Does this Trunk Tracker have the same problem? (William Tobin-Alaska)

A. The Trunk Tracker is a triple conversion radio and it is the first Uniden radio that has excellent image rejection capability. The PRO-39 scanner (made for RS by Uniden) is double

conversion. Like most Uniden double conversion receivers the PRO-39 does a poor job of image rejection.

I have personally tested the Trunk Tracker in one of the worse RF intermod/image areas of the country: in downtown Atlanta on Interstate 75/85 in front of the former Olympic village. There wasn't even a hint of a intermod/images.

Q. The Bearcat BC-235 XLT is advertised as being able to track only Motorola trunk systems. How do we know which systems are Motorola trunked systems? It would not be worth getting a BC-235 XLT if the trunked radio in our city were not Motorola. (William Tobin-Alaska)

A. If you buy that Trunk Tracker from Grove Enterprises, that won't be a problem since you have a 30-day, no questions asked, money back guarantee.

To give you a more straightforward answer, it is pretty simple to find out locally if the Trunk Tracker will work in your area. Turn on the scanner you have now and plug in the 800 MHz frequencies of the trunk system you want to monitor. Listen to one of the active frequencies and if you hear a set of tones after the conversation is over that sounds like the jingle used in General Electric commercials—don't buy a Trunk Tracker: You have a GE/Ericsson system in your location and the 235 will not follow that trunk.

If you hear nothing but hiss on the trunk frequencies then that is probably a digital system and the 235 won't follow that, either. Any other system should be a Motorola analog system and the Trunk Tracker will work fine.

You last alternative is to call our tech support line and see what information we have on file about your local system. That number is 704-837-7081 between 8 a.m. to 5 p.m. Eastern Time, Monday through Friday.

■ System Profile

This month's trunking system profile is courtesy of Albert Chailowa in the Garden State. Albert sent in information on the New Jersey State Patrol—Troop A.

If you have information on your local system you would like to share with your fellow *MT* readers, we want to hear from you. You can write us at: *Tracking the Trunks*, P.O. Box 98,

Brasstown, NC 28902 or via email to trunktracker@grove.net.

New Jersey State Police (Troop A) South

Headquarters: Hammonton
Stations: Absecon, Atlantic City Expressway (Hammonton), Bridgeton (Seabrook), Bellmawr, Berlin, Mays Landing, Port Norris, Red Lion (Vincetown), Tuckerton (West Creek), and Woodstown

System Frequencies: 855.2125, 855.4625, 855.7125, 856-860.4375, and 856-860.9375 MHz.

National Public Safety Calling and Mutual Aid (Tone 156.7 Hz):
866.0125 (Calling), 866.5125 (Tac 1), 867.0125 (Tac 2), 867.5125 (Tac 3), and 868.0125 (Tac 4)

System Fleet Map: Motorola Type III analog Sub Fleet Identifications

000-0	Fleet 1 (Fleetwide)
000-1	Division Calling
000-2	Headquarters (Hammonton)
000-3	East 3 Dispatch
000-4	South Bridgeton Dispatch
000-5	West Bellmawr Dispatch
000-6	Marine Units
000-7	Operations (Car to Car)
000-8	Command Post Operations
000-9	Int Operations (Car to Car)
000-10	Aviation Units
000-11	Executive Security
000-12	Atlantic City Expressway
000-13	Unassigned
000-14	New Jersey Turnpike
000-15	Garden State Parkway
400-0	Fleet 2 (Fleetwide)
400-1	Attorney General
400-2	Corrections (3B)
400-3	Gaming Enforcement
400-4	Department of Criminal Justice
400-5	Detectives Dispatch
400-6	Investigators
400-7	Investigators
400-8	Investigators
400-10	Medevac (not in use)
400-11	Human Services Police
400-12	Unassigned
400-13	Unassigned
400-14	Emergency Management
400-15	Corrections (3A)

26640	Superintendent
26672	Troop Commanders
26704	Spare
26736	Spare
26768	Corrections (3C)
26800	SouthStar Helicopter
26832	NorthStar Helicopter
26864	Spare
26896	Narcotics
26928	Spare
26960	Spare
26992	State Aquarium
27024	Spare
27056	New Jersey Turnpike (Car to Car)
27088	Parkway Headquarters
57296	Fleet 3 (Fleetwide)

Now Available from Grove: TrunkTracker BC895XLT

The enormous success of Uniden's hand-held BC235XLT Trunk Tracker is now complemented by the new BC895XLT, the most powerful monitoring tool available to the scanning enthusiast. Designed not only for serious scanning of conventional VHF/UHF land, sea, and air communications, but for automatically tracking Motorola trunking systems (I, II, III, and hybrid) as well! Triple conversion design enhances the performance of this new trend-setter.

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Some Thoughts on Multi-band Antennas

An antenna which covers more than one band is called a "multi-band" antenna. Some multi-band designs are simply several antennas designed for different bands but connected to the same feedline as shown in fig. 1A. Some multi-band antennas utilize trap circuits to accept or reject signals of certain frequencies and automatically route the desired signal to appropriate elements in the antenna (fig. 1B).

In an interesting and well-written article¹ Barker reports on an antenna utilizing a less-common technique of automatic frequency routing. This antenna, the multi-band, multi-layered, multi-resonant antenna (MMMA), has some features which are interesting to consider. Let's take a look at them.

■ The Multi-band, Multi-layered, Multi-resonant Antenna

The MMMA utilizes a "choke" to tune various portions of the overall antenna's length. This method is found in some commercial multi-band designs. Let's see how it works.

In fig. 1C we see an MMMA section designed for operation at two frequencies which we'll call F1 and F2. Length L1 is designed to support operation on F1, the lower of the two design frequencies. L2 is a quarterwave long at F2, and L3 is a halfwave long at F2. Note that where L2 parallels L1, the two wires form what can be thought of as a quarterwave section of two-wire transmission line. Note also that this transmission line section is shorted at its end farthest from the feedpoint.

A shorted quarterwave length of feedline presents a very high impedance (opposition to current flow) at its unshorted end. Obviously then, current flowing between the antenna feedpoint and the open end of this line section will encounter a high impedance at the open end of the transmission line. That high impedance greatly reduces current

flow past the open end of the transmission line section, and thereby effectively isolates wire L4 from the part of L1 on past L4. This isolated length, L4, on the wire L1 is functionally a quarterwave long at F2, and supports the antenna's operation at F2.

Barker suggests the MMMA will function using one section of the general type shown in fig. 1C operated against the earth (fig. 1D), or operated against a counterpoise consisting of another section identical to the first section (fig. 1E). He also suggests that two sections can be connected to form a halfwave dipole (fig. 1F).

Barker's comments that a single section of the MMMA can be used as a longwire antenna should not be interpreted to mean that it will function at its full potential by simply connecting it to a coaxial feedline which runs to our receiver or transmitter. He specifically mentions that such an antenna should be operated with a good earth ground. Due to this, we should probably think of the grounded MMMA not as a longwire, but more as a grounded Marconi quarterwave antenna.

On the other hand, it is interesting to note that one section of the MMMA, or any other sizable length of wire, will often support decent reception over much of the HF band

without the addition of a ground connection, counterpoise, radial, or anything else. Such an antenna or wire needn't be resonant nor match the feedline well for this reception. This is because reception on the HF band is limited not so much by the signal level delivered from the antenna as it is by the ratio of received-signal level to received-noise level (signal to noise ratio).

Thus, mounting a single section of an MMMA, or any sizable length of wire, high and in the clear, will often give decent reception of many HF signals. Nevertheless, when noise is exceptionally low on the HF band, having an antenna resonant and well-matched to the feedline can lead to better reception.

■ Let's Model an MMMA

To get a feel for the operation of the MMMA I designed one to cover both 160 MHz and 100 MHz. Nevertheless, my antenna's operating frequencies were not at 160 and 100 MHz as I had designed them to be. Cutting the MMMA, or any other antenna, to length as given by the formula normally utilized to determine antenna length almost always gives an operating frequency somewhat different than the one you enter into the formula.

This seems to be unavoidable due to varia-

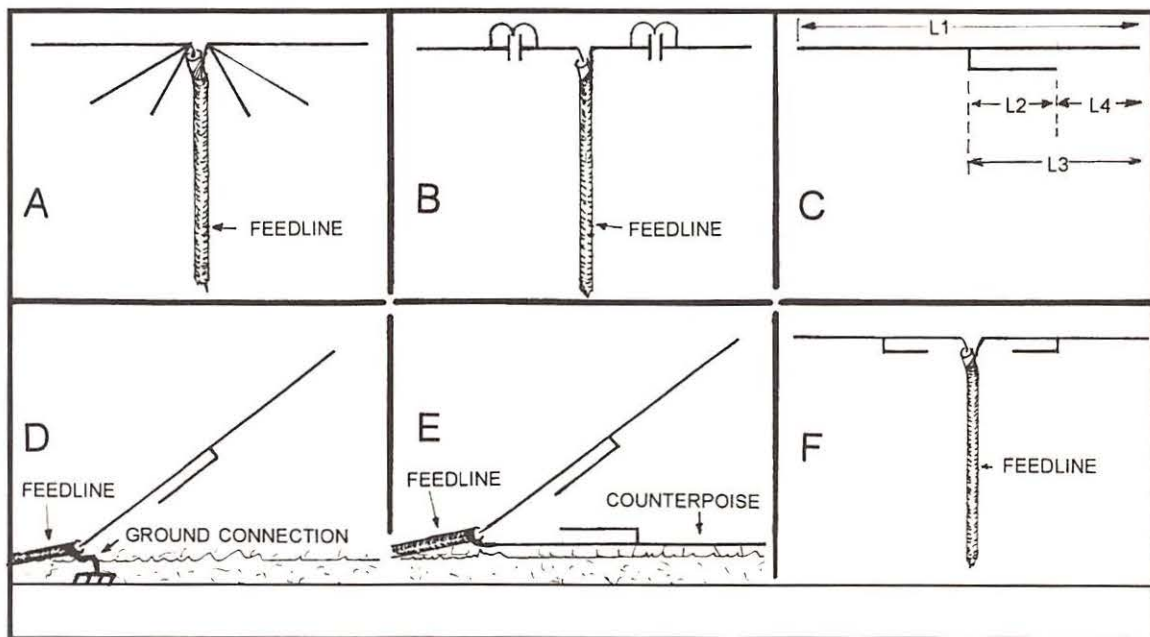


FIGURE 1. A Multi-element dipole antenna (A), a trap dipole antenna (B), a single choke-antenna section (C), a choke antenna with earth ground (D), a choke antenna with a counterpoise (E), and a dipole choke antenna.

tion in environmental factors between different locations. These factors include proximity to the earth and to various buildings or other structures in the antenna's general vicinity. As suggested below, coupling between multiple elements in an antenna can also cause the operating frequencies of an antenna to significantly depart from calculated values. Getting a formula-cut antenna to be resonant at the operating frequency you desire usually requires measurement its resonant frequency, and then adjusting its length as necessary.²

With the MMA wires bundled tightly together and taped in place as suggested by Barker the antenna functioned at F1 with an SWR of approximately 1:1, and at F2 with approximately 1.65:1. As the wires are increasingly separated, the SWR at F2 improved to about 1:1 with a separation of about 1/2 inch. The SWR at F1 remained around 1:1 throughout the tests. The resonant point for both F1 and F2 moved closer to their intended design frequencies as the wire separation increased. This is most likely due to less coupling between elements as separation is increased. Similar results were obtained with an HF model.

Thus, it seems that this type of antenna functions better with its stubs separated well from the main antenna wire (L1) than it does with the various elements bound tightly together. Separations of 1/2 inch or more for VHF, and 2.5 inches or more for HF should improve the antenna's performance for weak-signal work in low received-noise conditions.

Positioning L2 at right angles to L1 gave SWR values for F2 that were comparable to those at 1/2 inch spacing. This changes the antenna's mode of F2 operation from choke isolation to operating the wire length L2 + L3 at its third harmonic. This orientation of L2 is not recommended, as it would result in an antenna that is awkward to handle.

In summary, the MMA seems to be a decent design which would likely function better in low-noise situations if the elements were separated. Replacing the earth ground with radials would increase the efficiency of a single section antenna, especially for transmitting.

RADIO RIDDLES

Last month

I asked: "In our discussion of received interfering signals why haven't we covered those pesky 'birdies' we sometimes hear scattered across our dials." Well, it's because birdies are not *received* signals! They are spurious signals generated within the receiver itself. A

birdie sounds as if it is a continuous, unmodulated, received signal, and is always tuned in at the same spot on the dial. Receivers of good design have few, if any, birdies.

This Month

What, if any, is the difference between a "broadband antenna," and a multi-band antenna? Can an antenna be both broadband and multi-band?

You'll find an answer for this month's riddle, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.

¹ May 1997, *Monitoring Times*, pg 18-20.

Corrections for some lengths given incorrectly in Baker's article are reported in July 1997, *Monitoring Times* pg 4.

² Automatic SWR meters such as the MFJ, AEA, or Auttek are ideal for this.

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Q. Does the size of the crystal in a crystal radio make any difference in how well you hear the signal?

(Donald Michael Choleva, Euclid, OH)

A. Probably not the way you would expect. The important characteristic is the ratio between the forward and reverse resistance; the amount of current which flows is infinitesimal, so mass is not important. As a matter of fact, the best semiconductor detectors, as used in crystal sets, are the smallest. This is why the early cat's-whisker detectors used such a fine point to find a "sweet spot" on the mass of lead sulfide crystal (galena).

Q. I subscribe to one of those pagers that keep you posted on major fire and EMS incidents as they are occurring. Is there any addition I can make to help it receive at a further distance? (Wanda Hickey)

A. Pagers utilize internal loop antennas which are, by their very location, of limited size.

Since you don't know where the loop is physically placed, and assuming you don't have an external antenna jack, you might try the following experiment:

Install a rooftop scanner antenna, complete with coax cable routed down to the prospective pager location. If you have a connector on the bottom end of the coax, you will need a mating chassis-mount jack from Radio Shack. Solder a single wire loop, just big enough to go around the case of the pager, between the center pin and body of the jack.

With the pager on, hopefully receiving a signal, move the loop into various vertical and horizontal positions around the pager for best signal strength. You can use plastic tape to fix the coupler into place once you have found the "sweet spot."

Another alternative would be recommended only if you own the scanner, and only performed by someone familiar with radio. Open the case and find the small rod antenna. Drill a hole in the case as near as possible to the loop antenna, just large enough to mount a mini-jack for connecting an external antenna. Solder to this jack an insulated wire which runs around the loop for one turn, then back to the jack.

This type of close, inductive coupling is more efficient, but physically modifies the

scanner. Additionally, the presence of the new loop may require re-peaking the pager's RF amplifier stage for maximum signal strength. This touch-up should be done with the external antenna connected if the remote location is more important, or with it disconnected if close-in operation is more important.

■ NiCd Questions and Answers

The value of rechargeable nickel-cadmium batteries is legend, but a few facts will help you make the best choices.

Q. When is a NiCd cell or battery pack fully charged?

A. When the terminal voltage rises to 1.35-1.5 volts per cell. During its discharge time, it maintains a relatively constant terminal voltage of about 1.25 per cell. Therefore, a fully charged 12 volt NiCd battery would initially measure 13.5-15 volts, quickly dropping to 12.5 which it maintains during its discharge.

Q. What is meant by "discharging" a NiCd?

A. It doesn't mean dropping the charge to 0; it means reducing the charge per cell from

Bob's Tip of the Month

We have all had the experience of owning a scanner or shortwave radio with smudges ground into the plastic window displays. After an attempt at washing the window, we discover that the smudge is permanently etched into the plastic.

But all is not lost. Non-abrasive metal polishes like Brasso may be used quite effectively in reducing, or even eliminating, lightly-scratched plastic surfaces. Simply buff the plastic with the compound, allow it to dry, and wipe it off with a soft, dry cloth.

If the scratches are deep, or the plastic is

badly warped, discolored, or even broken, it will have to be replaced. But even that chore may not be as daunting as it would first seem, says *MT* reader Ray Miller, N2NJK. But let's let him tell us how he solved the problem on an old scanner he was restoring.

"The plastic display window was one of the worst that I'd ever seen. I didn't know what to try for a good replacement. I looked at craft stores, hobby shops, etc. to try to get an idea and nothing worked. When I was in a WalMart I spotted what turned out to be the perfect fix. They make a clip-on sun shade for the vehicle

sun visor. It is a smoked plexiglass for about four dollars. I brought it home, measured up the correct size, and cut a new display window out using a large X-acto knife. I covered both sides of the plastic with wide clear tape while cutting to avoid any scratches. I then placed it over the original display window. Finally, pleased with the way it would look, I put a dab of Krazy Glue on each corner."

Thanks, Ray, for the excellent suggestion. I'm sure that many of our readers will now be cruising the isles of the local department store looking for similar clear or tinted plastic.

Repairing Smudged Plastic Display Windows

1.25 volts to 1.0 volts; thus, a 12.5 volt NiCd battery, which consists of ten 1.25 volt cells in series, would be fully discharged when its terminal voltage reads 10.0. When you drastically drain the remaining charge on a NiCd, the cells can reverse polarity and dry out the electrolyte irreversibly.

Q. What is the lifetime of a NiCd cell or battery?

A. On the average, at least 2-3 years, assuming none of the cells goes bad. Some last 5-10 years. You should replace the NiCds when the useful discharge period becomes significantly shorter.

Q. Is there anything wrong with leaving an unused NiCd battery pack permanently on a charger?

A. The proper procedure is to charge a NiCd at 10% its rated capacity; thus, a 450 mAH AA cell should be charged at 45 mA until it tops off its terminal voltage at between 1.35 and 1.5 volts. This shouldn't take more than 12

hours on a discharged NiCd. It's OK to over-charge for a few hours, but continuous charging will shorten its life.

Q. Are fast chargers safe to use on a NiCd?

A. Yes, just so long as the battery doesn't get hot (warm is OK) or outgas from its vent.

Q. If, after 12-15 hours, the battery does not reach its appropriate terminal voltage, should it be discarded?

A. Not yet. A cell may be short-circuited by metallic crystal "whiskers" (dendrites) which grow from the electrolytic action on the plates. Try "zapping" the NiCd with substantial over-charge current for a few seconds in an attempt to melt the dendrite (do not let the NiCd get hot!). A cell could also be polarity-reversed from low-voltage discharge; try "exercising" the NiCd by several charge/discharge cycles before throwing it away. You should notice a sudden terminal voltage increase when the cell correctly repolarizes.

Q. How long will an unused, fully-charged NiCd retain its charge?

A. All cells and batteries self-discharge with time due to their own internal resistance. A fresh NiCd loses upwards of 10% of its charge per month at room temperature. It's always a good idea to "top off" the charge before using a NiCd that's been in storage.

Q. Does environmental temperature affect storage time?

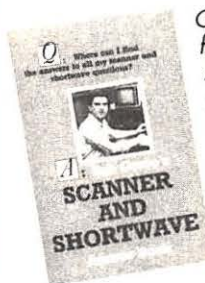
A. Yes, but not as much as most people think. Never put batteries in a freezer, but a refrigerator may add a few percent to the charge lifetime, both for NiCds and alkalines. Conversely, batteries stored in a hot car will self-discharge more rapidly.

Q. When building a battery pack, is it important to carefully match cells?

A. No. Don't mix sizes in order to avoid deeply discharging of a low-capacity cell which could result in polarity reversal, but don't worry about mixing brands, rated capacities (within a few percentage points), or relative ages. If you want to be on the safe side, charge or discharge the individual cells until they are all at either 1.0 or 13.5 volts before combining them into a pack.

Questions or tips sent to "Ask Bob," c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bgrove@grove.net. (Please include your name and address.) The current "Ask Bob" is now online at our WWW site: www.grove.net

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(LETTERS—Continued from Page 4)

references to Part 25 devices, call them **radios** instead of phones! Henceforth there is no such thing as an IMTS phone, cellular phone, cordless phone, or PCS phone. They are not telephones unless they are plugged into the wall.

"Replace 'phone' with 'radio' at all occurrences. When you write to your congresspeople or to the press, be sure to use the phrase 'cellular radio' when discussing these so-called phones."

Nothing in the word *telephone* should imply wires: tele=operating at a distance; phone=producing sound. But what the hey, if

changing vocabulary changes perception, perhaps we should shake the *cellphone* habit.

In the fantasy world of our cover illustration, Congress thinks if it says it's so, that makes it so. Rep. Tauzin says the Commercial Mobile Radio Service only includes cellular and paging services. That truth is only believed inside the chain link fence, while we in the real world bear the consequences. It's not the ordinary scanner listener that's leaking cellular conversations to the press, cloning cellular devices, or reselling information from paging services. But we law-abiding citizens are the ones who will have to bring the real world home to Congress.

—Rachel Baughn, editor

¡Hola! de Chile

Saúl Vergara Valenzuela of Santiago, Chile, says he is an avid DXer who especially enjoys catching long distance FM skip. His best catch was from Colombia in 1984. It appears that Saúl also verifies reception reports for Radio Esperanza on 6000 kHz from Temuco, Chile. For a QSL card send \$2 and your reception report to: QSL Editor Saúl Vergara Valenzuela, Calle Francisco Cerda #824 Recoleta, Santiago, Chile.



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By Bob Grove,
Publisher

America's Cacophony to the World

A Guest Editorial by Kim Elliott

■ Conflict of Interest

The Foreign Affairs Reform and Restructuring Act of 1997 is, as I write this, in House/Senate conference. One of its provisions is to integrate the U.S. Information Agency into the State Department. This poses a dilemma for the Voice of America, part of USIA since 1953. VOA's 86 million listeners tune to VOA mainly to get news that is more reliable, objective, and comprehensive than the news from their own government controlled media. Credibility is therefore key to VOA's success. Absorption into the State Department would, at the least, create a perception problem for VOA.

The international broadcasting provisions of the Senate version are likely to prevail. These would separate VOA from USIA and its State Department fate. VOA would report, through its parent International Broadcasting Bureau, to the Broadcasting Board of Governors, which will become a separate agency. The International Broadcasting Act of 1994 created the Broadcasting Board of Governors to serve as a "firewall" between the government and the elements of U.S. international broadcasting. The BBG, in its firewall function, has appointed the director of the IBB. This should have ensured VOA's autonomy.

But the Senate version of the 1997 Act gives VOA its independence and takes it away again. It also stipulates that the Director of the IBB would no longer be appointed by the BBG, but by the President, with the consent of the Senate. Thus, for VOA, the most important part of the BBG firewall will be breached. Furthermore, the Senate wording requires VOA to broadcast daily editorials, exercises in advocacy which set VOA apart from other Western international radio stations.

To help achieve the credibility necessary for success, VOA must have the same autonomy enjoyed by its government-funded cousins, Radio Free Europe, Inc. and Radio Free Asia, Inc. RFE/RL and RFA are also under the BBG, but their presidents are appointed by the BBG, not by the President of the United States.

■ Tortuous Organizational Structure

Autonomy is half the battle for the rationalization of U.S. international broadcasting. Efficiency is the other half. The structure of U.S. international broadcasting would boggle Rube Goldberg's mind. It consists of (1) the Voice of America (worldwide radio and Internet in 52 languages), (2) Worldnet-TV, and (3) the Office of Cuba Broadcasting, which consists of (4) Radio Martí, and (5) TV Martí. The aforementioned are part of an administrative entity known as the (6) International Broadcasting Bureau.

Not part of IBB are the "grantee" corporations (7) Radio Free Europe/Radio Liberty, Inc.—broadcasting in 22 languages of East Europe and the former Soviet Union, of which 17 are also transmitted by VOA and (8) Radio Free Asia, competing with VOA in seven languages. The (9) Broadcasting Board of Governors supervises the whole lot (1 through 8), though with no full time executive.

The Senate version of the Act provides two million dollars for a new (10) Radio Free Iran, which will broadcast news about Iran in Farsi to Iran. VOA presently broadcasts news about Iran in Farsi to Iran. There has also been Congressional discussion of (11) a Radio Free Afghanistan, and (12) Radio Free Africa. VOA already broadcasts to these places, too.

Thus, VOA and the Radio Free Whatever are duplicating and competing with each other, now in 25 languages, and soon probably in more. This is because of the U.S. "theory" of international broadcasting: the "official" VOA presents world and U.S. news and U.S. policies, the "surrogate" Radio Free X stations provide news about their listeners' own countries.

The theory does not reflect reality: VOA has always broadcast as much news as it could about its target countries, knowing it must do so to attract an audience. Duplication could be eliminated by forcing VOA to adhere to the theory, transmitting only world and U.S. news. Listeners would have to tune to one U.S. station to get part of the news, then retune through the miasma of shortwave to get the rest of the

news. They would probably opt for the BBC World Service, where they can get the convenience of all the news from one station.

In countries where foreign broadcasts are a necessary complement to domestic state controlled media, listeners want the most timely, comprehensive, objective, and relevant news they can get. It must be clearly receivable on their mostly cheap shortwave radios. The United States must concentrate its finite newsgathering, talent, and transmitting resources to provide such a service successfully, wherever it is needed.

■ A Simple Fix

To that end, here's a reorganization plan: Merge RFE/RL Inc. with RFA Inc. Bring VOA and Worldnet into this merged corporation. Rename the new corporation something worthy of a news organization (thus shedding the cold war pariah status that has kept Radio Free Asia from getting vital overseas relay transmitters and news bureaus). America's international broadcasting resources would then be concentrated into one globally effective multimedia organization. The BBG would continue as buffer between the government and the corporation.

(U.S. government international broadcasting should not compete with private efforts such as CNN and NBC International. But broadcasts in languages such as Swahili and Burmese will probably never be commercially viable and thus must be government funded.)

Broadcasting bureaucracies are being added while the budget for international broadcasting is shrinking (down 30% since 1994). By the year 2000, U.S. international broadcasting could consist entirely of numerous senior-level managements and front office suites. There might not be any money left for gathering news, making programs, or transmitting signals.

Dr. Kim Andrew Elliott is producer and presenter of *Communications World* on the Voice of America. Views expressed are his own and not those of VOA or the IBB. Kim's articles on U.S. international broadcasting include "Too Many Voices of America" in the journal *Foreign Policy*, Winter 1989/90.

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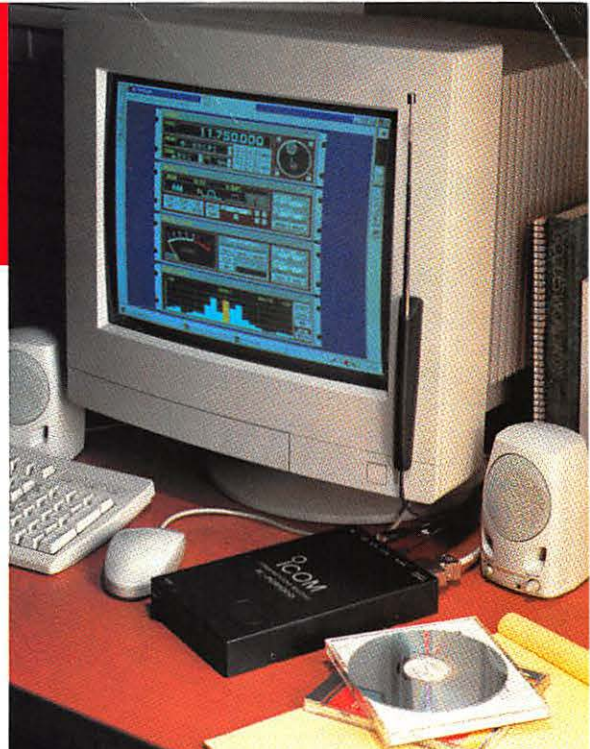
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